Guideline for T-shaped Environmental Leadership Development Program to Cultivate “Environmental Ability”
(An Undergraduate Foundation Program)

(Version 2010)

March, 2011

Working Group
Construction Project of T-shaped Environmental Leadership Development Program to Cultivate “Environmental Ability”

Table of Contents

Introduction

Progress of Mankind and Global Environment

In the 19th and 20th centuries, mankind demonstrated remarkable "progress." The world population reached approximately seven times the population in 1800; the average life expectancy greatly increased thanks to scientific and technological advancement; daily life became tremendously convenient and rich; and the global economic scale expanded exponentially. Such an increase of population and richness of the 20th century was based on the premise that "resources are inexhaustible and the global environment is infinite." In this sense, the market economy in the past, which is still present now, demands economic development and growth and can be described as a "one-way socioeconomic system" that stands on mass-production, mass-consumption and mass-disposal.

However, "resources and the global environment are both exhaustible." The progress of global warming, the loss of biodiversity and the increase of resource consumption due to human activities are greatly affecting the foundation of human survival and threaten our sustainability. According to *Global Green New Deal*, a report published by the United Nations Environment Programme (UNEP) in February 2009, the greenhouse gas emissions in the world would increase by 45% by 2030 and the mean air temperature would rise by 6ºC if the current conditions last and no measures are taken. The *Stern Review* that has put together the results of an investigation under the Chancellor of the Exchequer in UK also notes that a 5-6ºC air temperature increase could cause damage equivalent to 5-10% of the global GDP or 10% of GDP in developing countries.

Today, we stand at a crossroads where mankind 100 years from now will judge our decisions at the beginning of the 21st century as right or wrong. When we look 100 years forward in efforts to solve environmental problems such as global warming, it is crucial to pursue our society's transformation into a socioeconomic system that coexists with the global ecosystem. In this shared goal with the international community, it is now being anticipated that Japan will take an integrated approach to a low carbon, recycling and natural symbiotic society, while leading the global community to build a sustainable society.

Toward a Sustainable Society

A "sustainable society" is defined in Japan's *Strategy for an Environmental Nation in the 21st Century* as "a society in which a healthy and productive environment is preserved at the global and local levels, through which people around the world can enjoy and appreciate their happy lives, and in which such an environment is handed down to future generations." It describes an emphasis on the following three key points: Keeping environmental loads below the environment's carrying capacity;

minimizing consumption of resources and promoting recycling; and realizing the coexistence of nature and mankind. Thus, the perspective for "a sustainable society" regards the sustainability of the global environment and sustainable development, as well as human evolution, as two sides of the same coin and intends to maintain sustainability for both the earth's environment and its human inhabitants.

In *Our Common Future*, a report published in 1987 by the World Commission on the Environment and Development chaired by then-Prime Minister of Norway, Gro Harlem Brundtland, "sustainable development" is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Further explanation follows, "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations."

In this present age, we are required to bring together all kinds of wisdom and to make diverse efforts proactively for the purpose of founding a sustainable society.

UN's Education for Sustainable Development and Japan

In building a sustainable society, it is essential to foster environmental leaders in charge of green innovation and environmental issues in every organization including universities, corporations, governments and NGOs/NPOs. It is also necessary for each citizen to gain basic knowledge on environmental and sustainability issues, understand their significance and acquire skills as well as attitudes for addressing such issues.

At the Johannesburg Summit in 2002, Japan proposed the concept of a United Nations Decade of Education for Sustainable Development (UNDESD). In December of the same year, the proposal to designate 10 years from 2005 as UNDESD was unanimously adopted at the 57th UN General Assembly.

In order to implement specific measures for promoting UNDESD in a comprehensive and effective manner, the Japanese government established an interministerial collaboration and put together *Action Plan for United Nations Decade of Education for Sustainable Development* in 2006. The Action Plan defines ESD as follows:

"The foundation for sustainability consists of generation equality, regional equality, gender equality, social tolerance, poverty alleviation, environmental conservation and restoration, conservation of natural resources, a society for justice and peace, etc. Sustainable development promotes the environmental conservation, economic development and social development … in harmony. Such development does not happen unless each one of us acts consciously in daily life or through

economic activities. Thus, it is important for us to become aware that each individual is tied to the international community, future generations and the environment, and to transform our actions. The education for achieving this is called ESD.

The objective of ESD is also described as a process that “incorporates principles, values and actions required by everyone (an omission) for sustainable development into education and learning, bringing a transformation of actions for realizing an environmentally, economically and socially sustainable future.”

Japan’s Efforts in Environmental Leadership Development

In two of its cabinet decisions, *Strategy for an Environmental Nation in the 21st Century* and *Innovation 25*, Japan has incorporated the idea of environmental leadership development that can be mobilized domestically and internationally as one of the priorities.

Based on these decisions, the Ministry of the Environment, Japan (MOEJ) established a review committee consisting of key figures from universities, corporations and NGOs/NPOs, which formulated *Vision for Environmental Leadership Development for Asian Sustainability in Higher Education* (“Vision for Environmental Leadership Development for Asian Sustainability”) in March 2008. In order to put it into practice, the following three projects are to be developed with Environmental Leadership Initiatives for Asian Sustainability (ELIAS) in collaboration with relevant ministries: 1) developing and promoting environmental leadership development programs for each industrial field through the collaboration of industry, academia, government, and private sectors; 2) establishing an environmental consortium for leadership development through the collaboration of industry, academia, government, and private sectors; and 3) strengthening networks of universities in Asia that undertake the tasks in environmental leadership development.

Based on 2) above, experts from industrial, academic, government and private sectors in the field of environmental leadership development launched the Preparatory Meeting on Environmental Consortium for Leadership Development ("Preparatory Meeting") in March 2009. After two years of effort, the Environmental Consortium for Leadership Development (“EcoLeaD”) was established in March 2011.

According to the Preparatory Meeting office, research regarding the current state of environmental education at universities in Japan in 2008 (although 319 out of 765 universities in the whole country, which is equivalent to 41.7%, had some kind of environment-related programs), more than 80% of universities only had 1 or 2 programs with diverse curriculums. Also, the results show that the styles of lessons are mostly classroom lectures with few instances of completing a workshop or field work; it revealed that the courses are not enough to acquire knowledge, skill, or attitude as a whole to make decisions and become aware of environmental issues at actual job sites after graduation or in daily life.

The MOEJ and EcoLeaD decided to implement the *Construction Project of T-shaped Environmental Leadership Development Program to Cultivate "Environmental Ability"* to promote building a sustainable society based on the need for environmental leadership development and the current state of Japan's university programs regarding environmental issues. The project reflects the recognition that T-shaped environmental leadership development, which consists of expertise represented as a vertical line and systematic knowledge about sustainability and a bird's-eye viewpoint as a horizontal line, is an immediate need within the university system. The Preparatory Meeting consisted of individual organizations that could take advantage of their diverse strengths. A working group for examining program development was established under this Preparatory Meeting with experts in charge of education at universities and NGOs/NPOs etc. and others in charge of environmental matters at corporations.

The Guidelines for T-shaped Environmental Leadership Development Program to Cultivate "Environmental Ability" (An Undergraduate Foundation Program) (Version 2010) ("Guideline") is designed to teach basic knowledge of the environment mainly in general education courses at universities, and to help develop a capacity to take action toward environmental solutions. In other words, it is designed as an educational policy for T-shaped environmental leadership development program to cultivate "environmental ability." The Guideline does not target particular departments, but assume the usage at a wide range of departments regardless of humanities or science faculties. It was formulated with the intent to nurture the minimum required environmental knowledge or competence at corporations.

In recent years, the concept of "key competency (the key for success: good perception and the initiative to take action)" is gaining attention in the fields of both education and industry. "Key competency" is not only acquiring knowledge or skill but also the capacity to make use of a variety of tools or resources, etc. according to a situation, and to address complex problems. In other words, it can be regarded as the ability to make effective use of tools such as language, knowledge, information, technology, etc., or to form relationships in diverse social groups, and to take action independently and proactively. The development of "environmental ability" including knowledge, skills and outlook (which is the objective of the Guideline) leads to competence in identifying complicated environmental issues, making use of a variety of knowledge, skills, and resources, and taking action toward problem-solving, i.e. the development of "key competency" in the field of environmental study.

Learning about the environment is cross-sectional and wide-ranging. Thus, regarding practical in-school use of environmental leadership development programs - shown as a guiding principle in this Guideline - it is important that a collaborative vision between teachers with expertise in environmental issues (in the narrow sense), and experts in diverse fields, be shared toward furthering environmental leadership development. Now, it is a necessity to build a sustainable society within the limitations of "exhaustible resources and the global environment." We hope this Guideline will serve as a school-wide initiative to foster environmental leaders, particularly those possessing "key competency," and

benefit society in general, but particularly at universities where the significant mission is to develop such environmental leaders essential to building a sustainable society.

Chapter 1 Portrait of Environmental Leaders

1. Objectives of Guideline

This Guideline discusses the competence necessary to take action toward environmental solutions using a basic knowledge of environmental issues. In other words, it describes the educational policy for T-shaped environmental leadership development to explore the "environmental ability" mainly in general education courses at universities. This section details the horizontal part of the T-shape, "cross-sectional knowledge about environmental conservation and sustainability (knowledge with a panoramic and bird's-eye viewpoint)" and the educational contents regarding "skill and attitude concerning environmental conservation" using that knowledge.

2. Basic Ideas of Guideline

1) Definition and Elements of Environmental Leaders

According to the *Vision for Environmental Leadership Development for Asian Sustainability*, environmental leaders are "people who have foundations of their own experiences and ethical views, are able to consider the importance and urgency of environmental issues, have strong intentions to promote a sustainable society that realizes comprehensive improvement of the environment, society and economy through their own professions, citizen actions, etc., and bring social transformation with their leadership." For environmental leaders to be able to plan and implement specific projects in building a sustainable society through their professions, they are required to have three elements: "Strong motivation to take an initiative in building a sustainable society," "expertise" and "leadership."

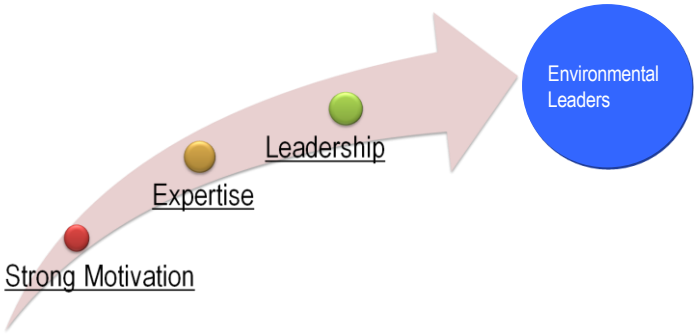


Figure 1: Three Major Elements Required for Environmental Leaders

More specific descriptions of each element are as follows:

- Strong Motivation
  . Enthusiasm that enables a person to understand and work with the complexity and diversity of building a sustainable society

- Expertise

. Own knowledge and experiences in fields other than environmental issues (such as law, management and technology)

. Ability to understand the relationship between one's expertise and the environment and utilize such expertise for environmental conservation

- Leadership

. Ability to conceptualize ideas and implement plans in order to integrate environmental conservation into socioeconomic activities

. Ability to influence involved parties, bring about consensus and mobilize an organization;

. A bird's-eye viewpoint to apprehend business, policy and technology from various aspects of the environment, economy and society

2) Necessity of T-shaped Environmental Leadership Development

The *Vision for Environmental Leadership Development for Asian Sustainability* describes that so-called T-shaped environmental leadership development is effective for nurturing quality that environmental leaders should carry. In such development, each individual enhances one's expertise in a specific field such as legal studies and engineering in a vertical direction, while acquiring cross-sectional knowledge in environmental conservation fields as well as internalizing and integrating environmental perspectives in one's own areas of expertise with a bird's-eye viewpoint or ability to overview in a panoramic way.

For fostering such environmental leaders, education that provides opportunities to learn cross-sectional knowledge concerning environmental conservation or integrates said knowledge into one's expertise is effective. Especially, general education courses at universities are thought to be successful as such an educational opportunity.

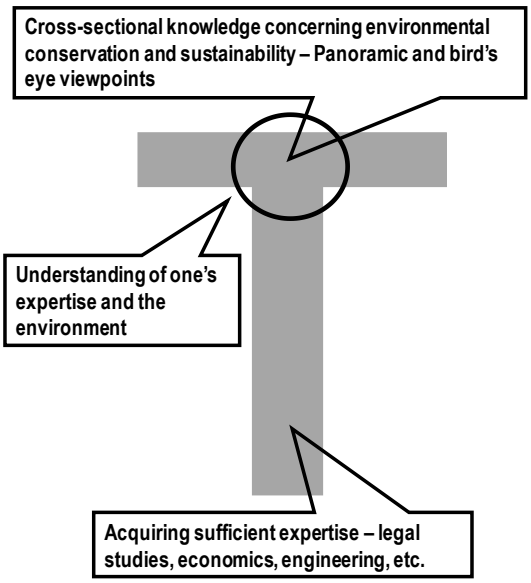


Figure 2: T-shaped System Required for Environmental Leaders

3) Fostering T-shaped Environmental Leaders with "Environmental Ability"

Environmental leaders are expected to build a foundation at universities on which they expand their T-shaped ability gradually with continuous learning and experiences through practice as professionals.

The gradual expansion of the T-shaped ability can be described as follows:

(1) Through general education courses at universities, T-shaped environmental leaders are fostered; such environmental leaders will have basic knowledge concerning environmental problems, which form the base of environmental leaders, and skill and an ability to take actions for solving environmental problems, or in other words, "environmental ability."

(2) The vertical part of the T, i.e. a foundation for an area of expertise is developed through specialized courses at university/undergraduate departments.

(3) The expertise represented by the vertical part of the T is strengthened through professional practices in a corporation or a government after one has graduated from a university.

(4) After deepening one's expertise through professional practice in a corporation, a government, etc., or directly after graduating from a university, one will enter a Master's program. S/he will learn practical ability including specialized knowledge concerning environmental management and various tools for promoting environmental management, enhance a bird's-eye viewpoint concerning sustainability as well as knowledge and skills of his/her area of expertise, and improve practical skills for providing solutions to various environmental issues and local challenges (i.e. grow the width and length of both vertical and horizontal axes of the T).

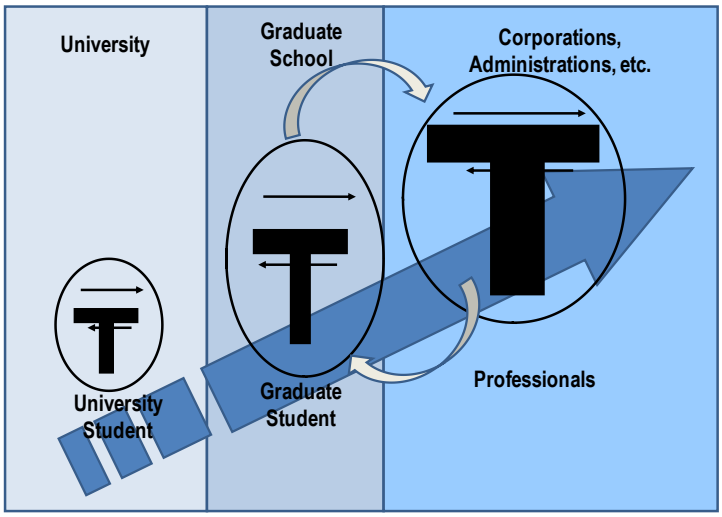


Figure 3: Gradual Expansion of T-shaped System

4) Requirements for "Environmental Ability"

"Environmental ability" in this Guideline should meet the following requirements:

- Basic knowledge regarding environmental issues
. Basic knowledge to grasp an overview of environmental issues

- A bird's-eye viewpoint
. A bird's-eye viewpoint which sees through diverse relationships to understand cause, effect, and solutions of complicated matters

- Skill (ability) to understand the relationship between one's own actions and environmental issues
. Ability to comprehend environmental issues or relevance of natural phenomena (interrelationship)
. Capability to link one's own knowledge to actual environmental issues (chain-thinking)
. Ability to understand global level environmental issues in one's own life
. Comprehension of how to deal with the environment from the viewpoints of both ordinary citizens and workers

- Skill (ability) to frame one's own ideas regarding environmental issues and form a partnership with others
. Capability to put one's own thoughts or interpretations about environmental issues together based on fundamental knowledge or experience
. Communicative proficiency and facilitation skills to have a consensus with others on environmental issues which tend to cause conflicts

- Attitude (readiness) to take positive action on environmental issues based on one's own ideas
. Attitude to take environment-conscious action for one's imminent environment
. Stance to take positive action to solve environmental issues using basic knowledge about the issues and one's own area of expertise or experience

These requirements for "environmental ability" include "a bird's-eye viewpoint," in which the overall picture of environmental issues is systematically grasped, or "comprehension of interrelationship" which links individual natural phenomenon and regards environmental issues as related to one's own behavior. Moreover, the skill to address problems and the initiative to take positive action are required in addition to environmental knowledge. In other words, the three elements, "knowledge," "skill (ability)" and "attitude (readiness)" are critical.

5) To Acquire a Bird's-eye Viewpoint, and Comprehension of Interrelationship and Complexity

In this guideline, **regarding the causes of and solutions for environmental issues from a big-picture perspective, the ability to grasp the whole picture of environmental issues, ("a bird's-eye viewpoint") is emphasized by considering the influences upon individual environmental issues resulting from a trade-off consequence, while comprehending the relationship between developed and developing countries, the connection between current and future generations, the relationship between mankind and nature, as well as that of individuals to society, moreover, the interrelations of mankind to economic or social activity.** Then, through acquiring this "bird's-eye viewpoint," one of the objectives will be to identify a long-term strategy for solving environmental problems and develop the capacity to recognize and explore opinions, volitions, and conflicts within various social statuses.

In addition, **how the issues above - human economic or social activity, individual environmental issues, etc. - are related or influence each other ("interrelations and complexity") is also weighed.** This Guideline aims to cultivate a responsible attitude toward environmental issues to develop an understanding of "interrelations and complexity" while learning the relevance of one's own behaviors on diverse environment issues and their complexities.

This Guideline is organized into the key points below while considering the importance of "a bird's-eye viewpoint" and the "understanding of interrelations and complexities."

- The contents are designed to elicit "a bird's-eye viewpoint" through which the present state of environmental issues and economic or social activities is comprehensively understood;
- In the introduction of the lessons, the objective is to acquire a bird's-eye viewpoint on environmental issues recognizing interrelations between individual environmental issues and mankind's economic and social activity, and to recognize the complexity of environmental issues;
- Regarding the educational contents of each class, the structure should be consistent in how it interrelates with the educational contents in other classes. For that purpose, collaborations among individual classes should be considered;
- At the end of the program, students should grasp an overview of environmental issues independently, establish the attitude of finding a solution from one's own viewpoint and take action.

6) To Acquire Knowledge, Skill and Attitude

In the statement which was agreed upon in the Tbilisi Declaration at the Intergovernmental Conference on Environmental Education in 1977, five objectives of environmental education were

identified - “interest (awareness),” “knowledge,” “attitude,” “skill,” “participation” - which serve as the basic concepts for global environmental education, including in Japan.

- Interest (awareness): Support social groups or individuals in acquiring sensitivity or interest in the whole environment or environmental issues;
- Knowledge: Cooperate with social groups or individuals in order to have diverse experience with various environments and the problems that go along with them, thereby acquiring basic knowledge of each;
- Attitude: Help social groups or individuals gather the motivation necessary to participate in the improvement and protection of the environment, develop sensitivity to the environment, and gain a sense of appreciation for the environment;
- Skill: Support social groups or individuals in acquiring the skills to solve environmental issues;
- Participation: Provide social groups or individuals opportunities to willingly take part in all kinds of activities directed at solving environmental problems.

Based on the Tbilisi Declaration viewpoint, the contents of “knowledge,” “skill” and “attitude” in fostering “environmental ability” are as follows:

- Knowledge: Basic knowledge of the environment in order to grasp an overview of environmental issues; a bird’s-eye viewpoint which understands the relevance between individual environmental issues and the activity of mankind; an interdisciplinary knowledge about relationships between environmental issues and one’s own acts;
- Skill (competence): An ability to make appropriate decisions regarding solutions to environmental problems, viewing them as personal and social concerns, while having an awareness of the complexities and interrelationships of environmental issues;
. Critical thinking with analytical skills to understand the core of the matter
. Decision-making ability for problem solving concerning links between entities
- Attitude (readiness): Attitude to take responsible actions for solving environmental problems and building a sustainable society while understanding the environment-conscious activity, moreover, the significance of activity for building a sustainable society.

The educational contents of this Guideline are designed to develop knowledge, skill, and attitude to the utmost extent in each lesson. Also, it draws on a teaching method which leads to self-motivated learning, thinking, and actions by not only learning about environmental issues but integrating the information at a personal level. Specifically, the following objectives are addressed:

- Understand the relationship between one’s own behavior and environmental issues, regarding them as one’s own problems, and nurture a sense of responsibility concerning environmental issues;
- Foster reverence toward nature and others while comprehending environmental issues including their complexities;
- Acquire an ethical perspective for the environment to realize a sustainable society in which

nature and mankind can coexist;

- Motivate one to deepen one's knowledge independently with a consciousness for environmental issues, and grasp the structure of problems in relation to others in order to consider potential solutions;
- Develop critical thinking to understand how to link the environment's present state, the causes for that state, and the results, then penetrate to the heart of each matter;
- Nurture discernment to choose acts of adapting environmental needs to socioeconomic systems for building a sustainable society while deepening the awareness of environmental issues and encouraging environment-conscious action in one's daily life toward the solutions in order to realize the future transformation of society;
- Cultivate an attitude to make responsible decisions by comprehending problems from a bird's-eye viewpoint and in terms of human activity, for the purpose of acquiring an overview of environmental issues as well as the mindset to refrain from behaviors that cause further environmental degradation.

Chapter 2 How to Use the *Guidelines for T-shaped Environmental Leadership Development Program to Cultivate "Environmental Ability"*

1. The Perspective on Structure of Educational Contents

This Guideline is comprised of nine basic classes which are beneficial to offer at any university regardless of faculty or department. Additionally, six reference classes are included, which should be consulted alongside the basic classes, with consideration given to each university's educational circumstances such as policy, characteristics, teachers and facilities on and off campus. On the whole, it is intended to be 15 classes per program.

The educational contents were organized with the following perspectives in mind to understand environmental issues:

- After comprehending the overview of environmental issues from a bird's-eye viewpoint and understanding the interrelation and complexity between environmental issues and human activity as well as individual environmental issues, explore how individuals and society ought to view building a sustainable society, and nurture the ability and outlook to make decisions and take action.
- Acquire scientific, economic, and social knowledge to learn the causes and structure of the issues and understand present environmental issues. Furthermore, comprehend environmental policy measures to find solutions and understand the role of each independent organization as well as efforts by corporations and NGO/NPO, and develop a capacity and attitude for making decisions and taking actions.

When designing a curriculum using this Guideline, it is important to assign one teacher, or a coordinator who coordinates and controls the overall program from the preparation stage to the class practice stage. This is to ensure consistency of the curriculum while giving consideration to linkage between classes as well as balance among academic fields.

In addition, please refer to the following key points regarding student assessment when using this Guideline for the lessons:

- Whether students could understand a relation between their own behavior and environmental issues and develop a sense of responsibility about them.

- If students could cultivate **a sense of ethics about the environment** to realize a sustainable society in which **nature and mankind can coexist**;

- Whether students, through their own initiative, could deepen their knowledge of environmental issues by developing **an awareness of the problems**, grasp **the structure of the problems in relation to other people**, and **consider measures toward solutions**;

- If students could understand a link between the present state, causes and results, and develop **critical thinking** that enables them to learn the heart of each matter;

- Whether students could cultivate the attitude and the ability for discernment to make responsible decisions regarding their own behavior and socioeconomic activities, as well as to understand the relation between behaviors and environmental issues, grasping the overview of those issues from a bird's-eye viewpoint based on a sense of commitment not to choose behavior leading to environmental degradation.

- If students who took the course could reflect upon his or her own behavior or **lifestyle** thus far and attempt to put environmental improvement into practice even on a small scale.

Based on this Guideline, when the course is offered in a collective-teaching system featuring visiting lecturers, it is important to revisit the "objectives" of each class and evaluate students' understanding and proficiency level by guiding them to review each completed class.

2. The Structure of the Educational Contents

Basic classes are organized into the following nine classes: "Introduction: What are environmental problems? (Basic 1)"; "The relationship between the earth and mankind; environmental issues and measures (Basic 2-5)"; "Each organization's efforts toward a sustainable society (Basic 6-7)"; "Partnership to construct sustainable societies (Basic 8)"; "Conclusion: For construction of sustainable societies (Basic 9)." These basic classes and six reference classes (1-6) are combined to encompass the whole program. The standard organization example plans are as follows.

In "Introduction: What are environmental problems?" (Basic 1), comprehend the relationship with fringe[1] issues as well as organize and cultivate the viewpoints regarding environmental problems after understanding an historical review of environmental problems, the process of problem generation, and other diverse elements to consider the cause of and solution to the problem.

"The relationship between the earth and mankind; environmental issues and measures" (Basic 2-5) are organized into four classes. After understanding the relation of population growth to environmental issues, as well as the interrelations between the development of mankind and the resource energy consumption increase in Basic 2 ("History of the earth and mankind and

[1] Fringe: Tufts of thread or woolen yarn on the edge of cloth. The term has shifted to mean problems related or incidental to the issues.

environmental issues"), students will nurture environmental ethics for building a sustainable society.

Moreover, in Basic 3, "Global system and ecosystem," and Basic 4, "Resources and global capacity," students will learn that global systems, ecosystems, etc. are in critical condition due to human activity and will consider how society should proceed, while considering environmental issues such as: The earth's 4.6 billion year history and the scientific mechanism at work within the global system; ecosystem services carried through the earth's ecosystems; availability of natural resources; environmental carrying capacity, etc.

Then, explore pollution problems and response in Japan as well as environmental problems generated at the global level and their corresponding measures; learn lessons from the experience of pollution problems and from global environmental problems under present circumstances and their future outlook.

Understand environmental issues as a whole from the viewpoints of natural history, history of mankind and culture, or human socioeconomic activity; comprehend the overview and the structure of the causes through the system or history of "the earth" and "mankind," a bird's-eye viewpoint, and mutual relevance; cultivate the capacity to think on one's own and make decisions and acquire an attitude to approach building a sustainable society independently and positively.

It is widely held that to encourage the action toward environmental solutions, one should learn about and comprehend individual environmental issues in detail using reference classes after understanding the relation between the earth and mankind, as well as an overview of environmental issues and measures.

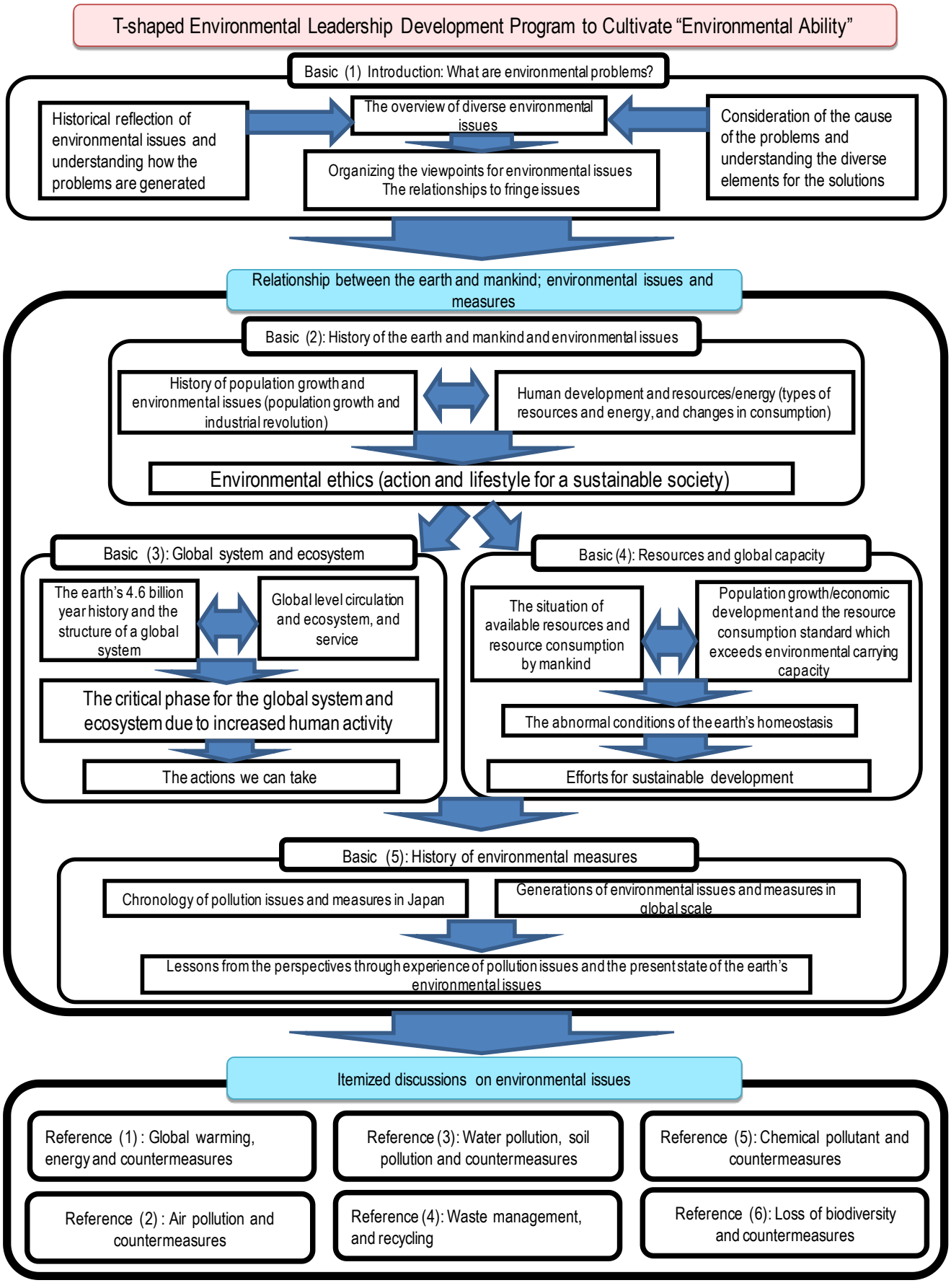
"Itemized discussion of environmental issues" (Reference 1-6) are reference classes composed of "Global warming, energy and countermeasures" (Reference 1), "Air pollution and countermeasures" (Reference 2), "Water pollution, soil pollution and countermeasures" (Reference 3), "Waste management, and recycling" (Reference 4), "Chemical pollutant and countermeasures" (Reference 5) and "Loss of biodiversity and countermeasures" (Reference 6). Furthermore, one must understand not only scientific mechanisms but also the relationship between human socioeconomic activities and environmental issues, and, over the course of each class, cultivate the ability to think on one's own and the attitude to take action. For example, "countermeasures" in each class of the educational contents include international treaty, political measures such as laws and regulations or policies, and the actions taken by each individual in addition to scientific technical measures.

Moreover, in the lessons, it is desirable to consider educational policy, characteristics, teachers or educational facilities on and off campus, the background of students, etc. Also, it is possible to teach only basic classes without including reference classes.

In the lesson “Each organization’s efforts toward a sustainable society” (Basic 6-7), students learn the efforts of government/municipalities (administration), corporations, NGOs/NPOs and their roles and responsibilities including examples. The lessons provide students the opportunity to understand these efforts by inviting representatives from organizations etc. to describe practical measures they have implemented.

In the theme “Partnership to construct sustainable societies” (Basic 8), students will be engaged in research/discussion, understand the roles and responsibilities of diverse individual organizations which compose a society, comprehend the importance of these organizations’ efforts for a sustainable society through collaborations with each other, and develop an attitude to take action on one’s own.

In “Conclusion: For construction of sustainable societies” (Basic 9), students will understand the overview of the environmental issues learned thus far and the concept of sustainability, and explore the relevance between one’s own behavior and environmental issues. Students will be able to explain the actions to be taken, and will be encouraged to carry them out, after comprehending the overall structure, interrelationships, and complexities of the issues.


T-shaped Environmental Leadership Development Program to Cultivate "Environmental Ability"
Basic (1) Introduction: What are environmental problems?
Historical reflection of environmental issues and understanding how the problems are generated
The overview of diverse environmental issues
Organizing the viewpoints for environmental issues
The relationships to fringe issues
Consideration of the cause of the problems and understanding the diverse elements for the solutions
Relationship between the earth and mankind; environmental issues and measures
Basic (2): History of the earth and mankind and environmental issues
History of population growth and environmental issues (population growth and industrial revolution)
Human development and resources/energy (types of resources and energy, and changes in consumption)
Environmental ethics (action and lifestyle for a sustainable society)
Basic (3): Global system and ecosystem
The earth's 4.6 billion year history and the structure of a global system
Global level circulation and ecosystem, and service
The critical phase for the global system and ecosystem due to increased human activity
The actions we can take
Basic (4): Resources and global capacity
The situation of available resources and resource consumption by mankind
Population growth/economic development and the resource consumption standard which exceeds environmental carrying capacity
The abnormal conditions of the earth's homeostasis
Efforts for sustainable development
Basic (5): History of environmental measures
Chronology of pollution issues and measures in Japan
Generations of environmental issues and measures in global scale
Lessons from the perspectives through experience of pollution issues and the present state of the earth's environmental issues
Itemized discussions on environmental issues
Reference (1) : Global warming, energy and countermeasures
Reference (2) : Air pollution and countermeasures
Reference (3): Water pollution, soil pollution and countermeasures
Reference (4): Waste management, and recycling
Reference (5): Chemical pollutant and countermeasures
Reference (6): Loss of biodiversity and countermeasures

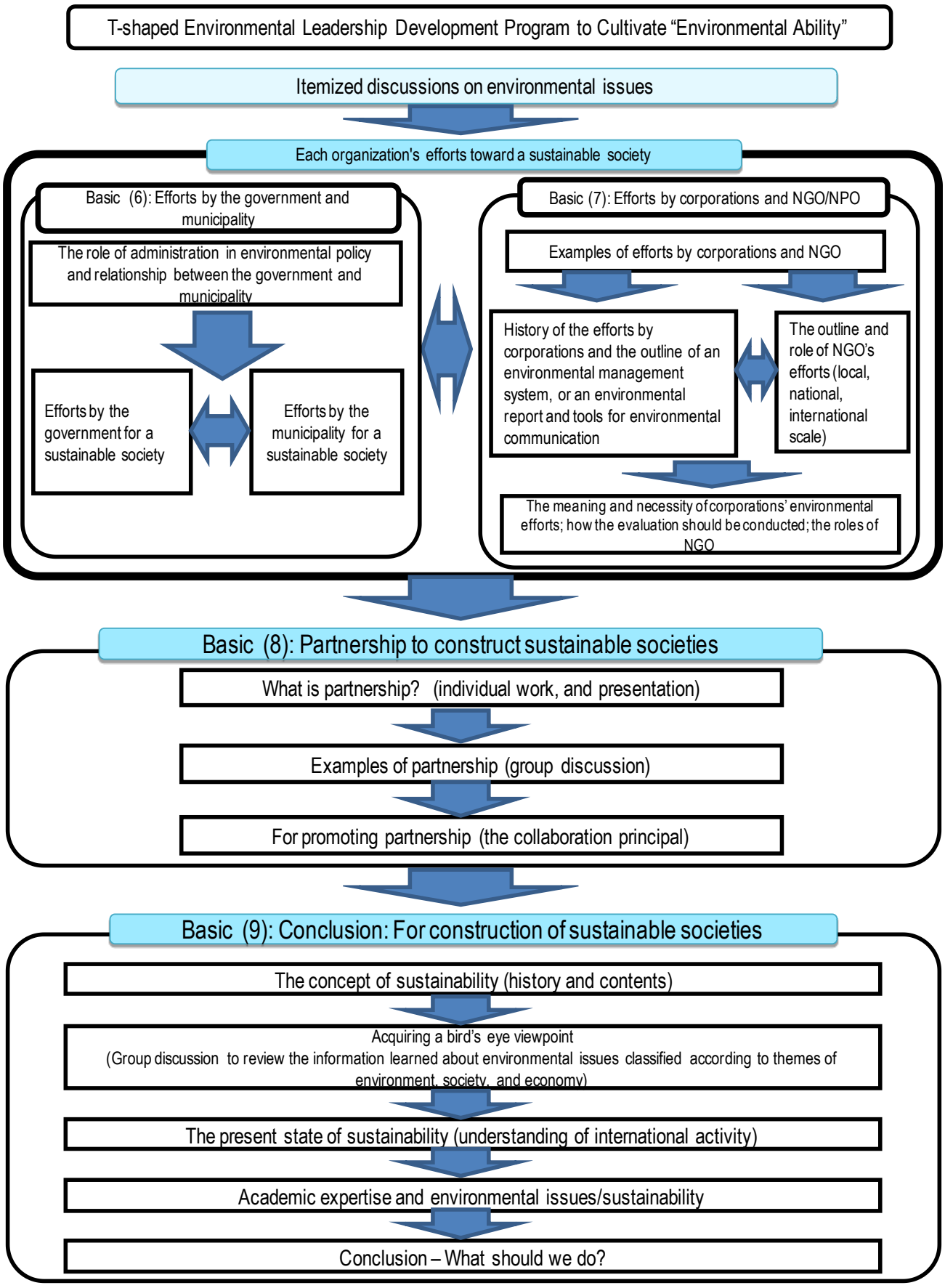


Figure 4: Structure of Educational Contents in this Program

The structure of this program is intended for horizontal part of T-shaped environmental leaders as Figure 5 shows. The educational contents are organized to develop a bird's-eye viewpoint and understanding of interrelationship or complexity of environmental issues.

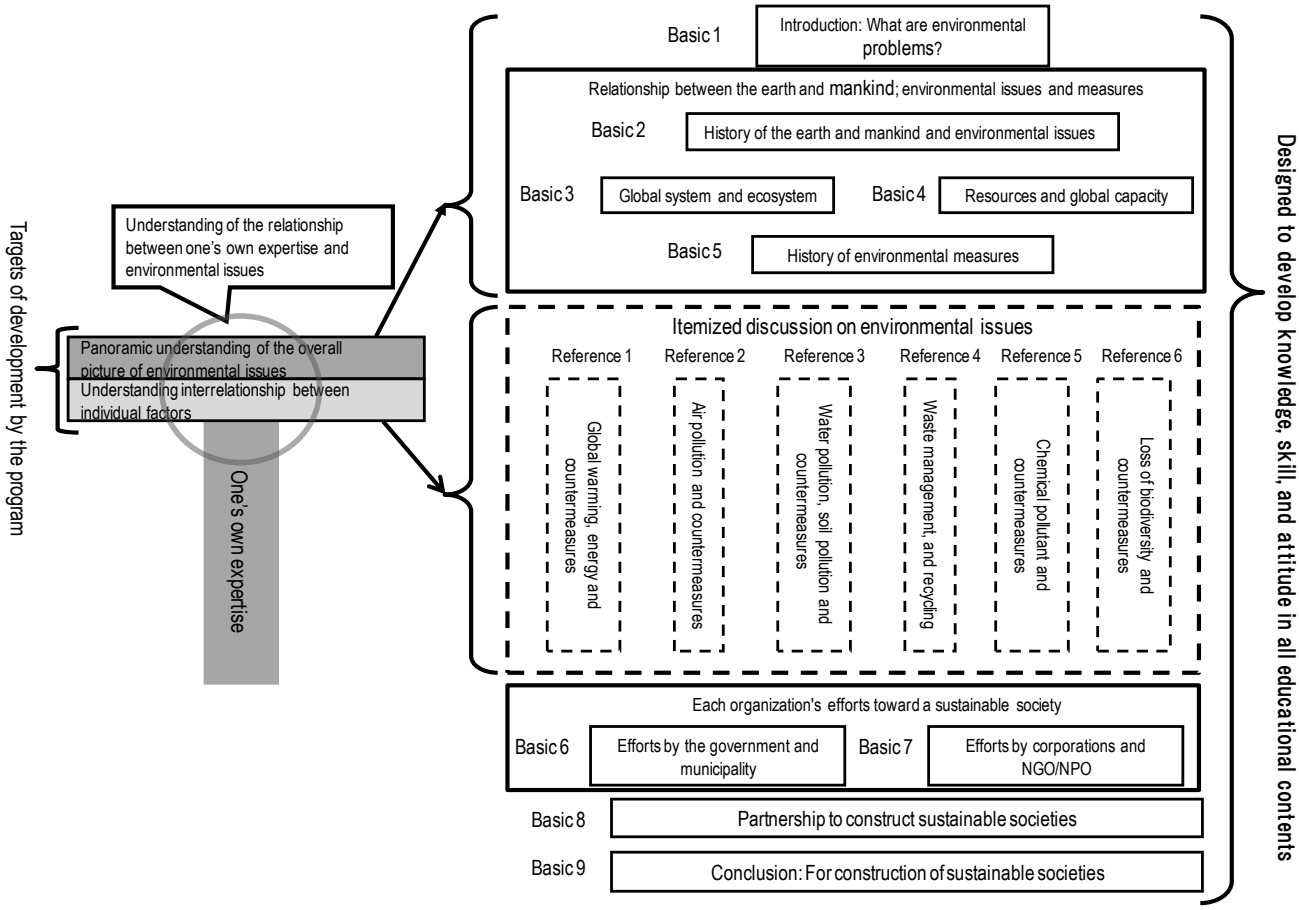


Figure 5: Relation Between the T-shaped Environmental Leadership Development and the Contents of Environmental Education

3. Structure of Program to Acquire Skill and Attitude

In the case that this Guideline is used at each university, it is required that the course curriculum and teaching method consider the education policies and characteristics of the university, the current situation of the area where the university is located, departments and courses which implement the curriculum, and the number of students taking the courses.

In addition, it is recommended to promote effective development of skill and attitude by providing hands-on learning or workshop-style lessons, etc. as stated in 6) of unit 2, chapter 1 in this Guideline. For such purposes, it is required to use a variety of teaching methods other than classroom lectures: hands-on learning such as field work, research or discussion by students, workshop-style lessons such as presentations. In chapter 4 of this Guideline, practical examples of education methods considered to be effective in acquiring skill and attitude are compiled. Diverse lessons should be created by referring to these methods.

The examples of combinations of hands-on learning or workshop-style lessons for each class are as follows:

1) In implementing lessons for each class, use a variety of learning styles as required, projecting to nurture skill and attitude.

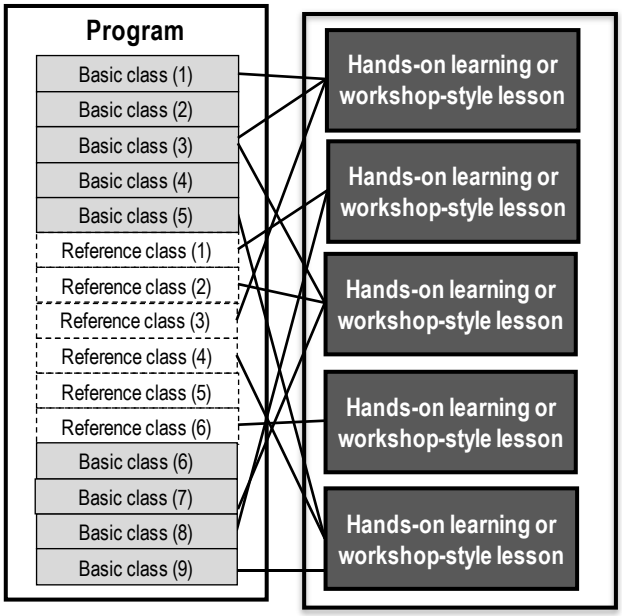


Figure 6: Example 1 for Curriculum Design to Develop Skill and Ability

2) Create lessons using hands-on learning to acquire skill and attitude or workshop-style lessons separate from basic/reference class lessons. The number of lessons or timing for such hands-on learning and workshop-style lessons will be determined according to the circumstances of each university or department.

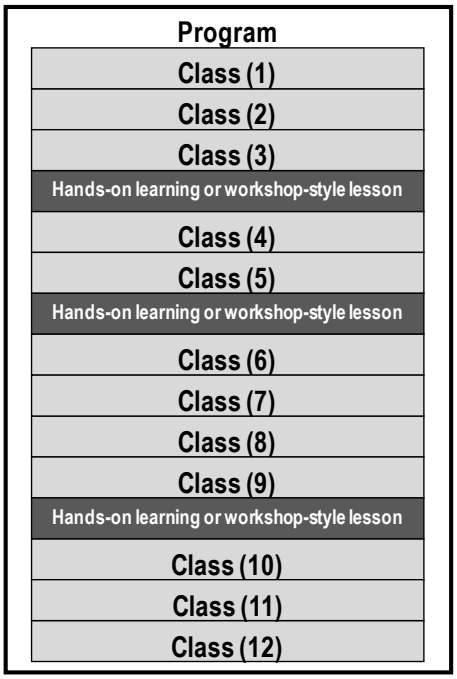


Figure 7: Example 2 for Curriculum Design to Develop Skill and Ability

4. The Structure of Each Class

Each class is composed of educational objectives (summary of the educational contents) and an outline of educational contents based on those objectives (90-minute lesson models, with relevant contents including explanation, keywords, additional classes, etc.). Specific structure of each class is as follows.

■ **Objectives (Summary of Educational Contents)**
Describes a summary of educational contents including “knowledge,” “skill” and “attitude” which should be acquired in the corresponding classes.

■ **Outline of Educational Contents**

1. Basic Contents (90-minute lesson model)

In each class, the 90-minute model lesson will encompass material from “introduction” to “conclusion,” and the criterion time when teaching contents are integrated.
Here, the points to remember or consider as the cores are described as “background” or “structures of the causes.” Also, the links to students’ daily lives, etc. (motivation) are explained as intricately as possible.
*Example of basic contents
(1) Introduction (10 minutes)
(2) XXX (xx minutes)
(3) YYY (yy minutes)
(4) Conclusion (10 minutes)

The Points of this Class (points to remember or consider important)

Points to remember or consider as important in teaching this class are described.

2. Description of the Basic Contents

Specific teaching strategies for each basic content are described.

3. Keywords for the Basic Contents

Key words in each basic content are described if necessary.

4. Additional Contents (if necessary)

Contents to be utilized according to an individual situation or additional contents which could be given are described comprehensively but briefly.

5. Additional Keywords (if necessary)

Keywords in each additional content are described if necessary.

Chapter 3 Educational Contents of Each Class in T-shaped Environmental Leadership Development Program to Cultivate “Environmental Ability”

1. Basic Classes

【Introduction】

1) Introduction: What are environmental problems?

■ Objective

When it comes to “environmental issues,” “conservation of natural environment” and “environmental pollution/destruction from artificial causes” is often considered to be major themes. The former deals with ethical consideration of the relationship between human and nature, as well as natural science matters regarding the conservation of ecosystems and biodiversity. The latter addresses environmental concerns starting with public health issues (pathogenic microbes), pollution problems (seven typical types of environmental pollution), regional issues (such as eutrophication, regional air pollution, diffusion of micro chemical substances or endocrine disruptors), and global environmental issues such as climatic change and ozone layer depletion. In addition, although pollution issues are “exit side” problems, resulting from the human use of various resources, it is necessary to refer to “entrance side” resource issues (energy concerns, depletion of mineral resources, water resource problems, etc.) as these are inseparable from the said “exit side” problems. Moreover, population problems, which are the original cause of this generation of environmental issues, food security and safety issues, which are the target of environmental criticism (regarding quantity and quality), are also to be considered. Furthermore, problems relating to poverty as well as the North-South issue must be explored, as these critical matters serve as barriers to environmental solutions.

In the first lesson, students will learn an overview of diverse environmental issues (above) and organize important perspectives to deal with them, e.g., 1) the relationship between mankind and nature, 2) difference due to spatial scale, 3) the development or transition of issues over time, 4) ambiguity of environmental issues (positive and negative sides) etc. Also, as environmental issues arise from elements of natural or social sciences, which are complicatedly related to each other, it is necessary to consider a variety of elements to solutions for environmental issues. Thus, students learn that integral implementation of scientific, technical, economic, and social measures are required while understanding each component of environmental issues as an integrated system.

Furthermore, in the introduction to this Guideline, the concepts of a “sustainable society” and “education for a sustainable society” are described. Regarding the environment in the 21st century, one of the most crucial concepts to explore is sustainability. The aforementioned view, that is “the

integral implements … as well as regarding each component of environmental issues as an integrated system" is essential to actualize a sustainable society; in order to provide environmental education according to this Guideline, the concept of "sustainability" should be constantly revisited.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction (20 minutes)

Encourage students to give examples of "environmental issues" and discuss how to classify them.

(2) History (30 minutes)

Present environmental issues through history and explain the background of public health issues, environmental pollution problems, regional environmental issues, global environmental issues, conservation of ecosystems and biodiversity, resource/energy problems, food issues, etc.

(3) Examples (20 minutes)

Give specific examples (e.g. Minamata disease, global warming, etc.) and lead students to make a list of diverse (natural scientific, technical, economic, social, etc.) elements regarding the causes of and solutions to the issues. Let them understand the significance of a bird's-eye viewpoint through this process.

(4) Conclusion (20 minutes)

Describe the relevance of environmental issues and fringe problems (resource problems, population problems, issues of poverty, or food issues) while examining the viewpoints of environmental issues. This leads to reflecting on sustainability for the entire mankind.

The Points of this Class

It is impossible to penetrate to the heart of the matter from a unidirectional viewpoint, since environmental issues include diverse elements. Specifically, the relation between perpetrator and victim is not unambiguous in today's environmental issues; there can be trade-offs among environmental issues or other problems (e.g. development, human rights, economy). The point of this first lesson is to introduce students to the various facets of the diversity which surrounds environmental issues that will be presented in the following lessons. For this purpose, it is necessary to plan time to help students think independently via interactive methods, in addition to presenting unilateral class lectures. Instructors should focus on nurturing students' interests over the remaining dozen or more lessons, rather than expect students to grasp everything in one lesson.

2. Description of the Basic Contents

(1) Introduction (20 minutes)

a. In studying environment issues for further lessons in the term, firstly, introduce students to many possible viewpoints in order to grasp environmental issues. In short, there are a variety of measures from different viewpoints such as technology, economy, society, culture, etc. Describe to students what they are expected to learn in the coming term, even though they may not understand the specifics at first.

b. Encourage students to give examples of “environmental issues.” Suggest that each student give one example, and make a list of approximately 10 examples.

c. Give students an opportunity to discuss and classify the examples. The point of the classification is to identify a spatial context (topical, regional, global level, etc.), time frame (temporal effects, effects beyond the current generation, the change of issues over time), types of pollution or pollutants (category of toxicity, point & non-point sources, global warming and ozone layer depletion), etc. Here, the direction or process of discussion is not important. Proceed to the next step without reaching conclusions.

(2) History (30 minutes)
a. Review environmental issues from a historical angle to illustrate “c. classification” above. For this part, choose contents according to the specialization or expertise of the teacher in charge.

b. Describe the details of diverse types of environmental issues in the following methods, for example:
Hygiene issues (epidemics of bubonic plague and cholera, waterborne diseases, etc.)
→ Pollution issue mainly after the Industrial Revolution (environmental pollution caused by toxic substances, e.g. Minamata disease, London Smog)
→ Regional environmental issues (regional air pollution, acid rain, large-scale salt damage due to agricultural development, cross-border waste transfer, etc.)
→ Global environmental issues (global warming, ozone layer depletion, etc.)
→ Diverse issues regarding sustainability for the whole mankind (conservation of ecosystems and biodiversity, resource or energy concerns, food issues, etc.)

(3) Examples (20 minutes)
a. Illustrate one specific environmental issue as an example, and lead students to discuss various facets of it. Also, select an issue which is easy for the teacher in charge to discuss.

b. Discuss examples of environmental issues such as Minamata disease, global warming, etc., and help students make a list of diverse (natural scientific, technical, economic, social) elements regarding the causes of these problems and their solutions. Choose issues the majority of students are either interested in or have some knowledge about. Ensure that the diversity within said issues is easy to describe. For this procedure, consider posting a chart (example below) on the wall or blackboard, and write comments in each column.

	Natural Scientific /Technical	Economic	Social
The causes of environmental issues			
The solutions of environmental issues			

c. Through this work, help students experience and understand the significance of a bird’s-eye viewpoint for environmental solutions. In addition, uncertainty may interfere with the process of

investigating causes for or solutions to issues, as in the example of Minamata disease or global warming. For instance, the uncertainty that global warming may or may not actually exist is often expressed. In that case, a teacher's presentation of a problem can be significant such as, "Why might the validity of this issue be controversial?" At this point, it is expected that many students do not fully understand the complexities of each category. Thus, it may be necessary for the teacher to offer support such as providing examples for the first few points and fill in the columns. Again, go to the next step even if students' understanding looks insufficient.

(4) Conclusion (20 minutes)
a. As a conclusion to (3) above, guide students to become aware of diverse viewpoints regarding environmental issues and encourage them to acquire their own methods for organizing said viewpoints through this lesson.
b. Briefly review the relevance between environmental issues and fringe problems (resources, population, poverty, food) and end the lesson. The concepts at this point could, for example, be presented as follows, "Attention must be given to waste issues (exit-side issues), which have arisen from human lifestyle habits. On the other hand, there are problems on the entrance side in providing for the needs of human life, such as resources and food." Also, as social problems to support the flow of materials, there are issues regarding economy, population, poverty, peace, etc. Waste should be utilized as a resource in a recycling society, and food issues have structural and deep connections to the environment through water resource concerns, biomass as energy supply, etc. In addition, the examples in which the state of society affects the environment are too abundant to enumerate (e.g. modern capitalism structurally enlarges the range of human activity, which leads to the increase of environmental influences; war destroys the environment in an instant; there are countries which, due to poverty, cannot conceive of environmental considerations.)
c. All of these issues have significant relevance to the sustainability of mankind. This "introduction" part should be a preparation for participating in a discussion about sustainable society in the last lesson, after keeping students engaged throughout the term.

3. Keywords for the Basic Contents
The keywords in this lesson are "global environmental issues," "sustainability," and "sustainable society." For the specific contents of each keyword, please refer to keywords in each class following.

【The relationship between the earth and mankind; environmental issues and measures】

2) History of the earth and mankind and environmental issues

■ Objective
・In this second lesson, by presenting the themes of the progression from mankind's origins to modern man's emergence, the establishment of an agricultural society following the Neolith Revolution (agricultural revolution), and the transition to an industrial society following the Industrial

Revolution, teachers will reveal the conditions that comprise the historical background of modern global environmental issues. These issues are (1) the transformation of energy types or structures of resources on which mankind depends, (2) the increase of energy and resource consumption due to population growth and economic growth, and (3) the increase of energy and resource consumption due to economic development and a rising living standard. Then, students will deepen their understanding of the North-South gap considering lifestyle or standard of living, and modern people's conduct based on (4) an environmental ethics point of view.

・The true nature of modern environmental issues are first population growth, and then economic growth and technological innovation which made the aforementioned growth possible. Through these means, mass production and mass consumption increased the environmental load, thus environmental pollution and destruction ensued. Further, after the Industrial Revolution, an increased dependence on non-renewable fossil fuels brought climate change such as global warming resulting from carbon dioxide emissions released into the atmosphere, as well as concerns regarding energy depletion in the latter half of 20th century.

・Given the considerations above, remember that the 21st century is the era when the population, which has been growing as an industrial civilization, approaches the limits of the population bearing capacity for energy, food, water etc. Also, understand that it is the period when climate change began as a result of peculiar technology systems in industrial civilization. In addition, realize that the establishment of new environmental ethics to reflect human conduct as well as the transition to a new civilization system which actualizes a sustainable society (by means of energy conversion) are required to avoid the consequences of environmental issues such as climate change etc.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction (20 minutes)

Make a mind-map regarding population issues (KJ method)

(2) History of population growth and environmental issues (20 minutes)

The beginning of modern population growth and industry revolution, history of population growth rate which has wavy line on the graph

(3) Human development and resources/energy (20 minutes)

The change of types (composition) of resources/energy sources and the resulting changes in consumption and depletion of food

(4) The viewpoint of environmental ethics (20 minutes)

Consider solutions necessary to the North-South issue, conduct, and lifestyle in order to realize a sustainable world

(5) Conclusion (10 minutes)

What do population issues in the 21st century mean for us and the environment?

The Points of this Class

- "Identify" "population issues" based on one's own experience or knowledge.

- Understand that the relation between “population issues” and “economic growth” or “environmental issues” is not one-sided action but a reciprocal relationship.
- Realize that environmental influence comes not only from population size but significantly from the standard of living.
- Though a declining population trend in developed countries and population growth in developing countries seem like contradictory phenomena at first glance, see them as integrated using demographic transition theory.
- Recognize that the 21st century, in which mankind faces environmental issues, is the period when population growth and economic growth experience restrictions due to the maturity of an industrial civilization.
- Learn about the past era when the population and the environment were in a tense relationship.
- Through exploration of the population wave mechanism, consider a new, ideal civilization which evolves from an industrial civilization.

2. Description of the Basic Contents

(1) Introduction (20 minutes)

- Each student writes down as many key words regarding population issues s/he can think of.
- Individually or in groups, make a mind-map using the KJ method.
- Consider the relevance of problem areas.

(2) History of population growth and environmental issues (20 minutes)

- Through historical statistics of world population, understand that the transition to an agriculture civilization brought population growth to human history in general, and the modern population increased even more after the Industrial Revolution in the 18th century.

(3) Development of mankind and resources/energy (20 minutes)

- Learn that population growth from the Industrial Revolution, and the sustainable growth of the economy (modern economic growth), which exceeded population growth, were supported by energy conversion from biotic to mineral. Understand the issues due to world population growth (depletion of resources, energy, or food; environmental pollution and destruction).

(4) The viewpoint of environmental ethics (20 minutes)

- Learn about the North-South issue with regard to population (the trend toward population decline in developed countries and population growth in developing countries).
- Understand the process of the modern birthrate and population decline by demographic transition theory, while considering the population growth history in developed countries. Learn that the birthrate decline in developing countries started after the1980’s, and that those countries are moving toward a demographic transition.
- Understand that demographic transition is the result of economic development; mitigation of population growth does not always reach the environmental solutions; suppression of desire and the change in awareness of abundance are required.

(5) Conclusion (10 minutes)

- Consider population issues in 21st century.

3. Key Words for the Basic Contents

(2) History of population growth and environmental issues

Population explosion, demographic transition, birthrate decline.

(3) Development of mankind, resources and energy

Neolith Revolution, Industrial Revolution, energy revolution, renewable energy, nonrenewable energy.

(4) The viewpoint of environmental ethics

North-South issue, maturity, stable society, sustainable development.

4. Additional Contents

(1) Principle of population and demographic transition theory by Thomas Robert Malthus (population is influenced by environmental constraints)

(2) Technology development theory by Ester Boserup (Environmental constraints are not fixed; the environmental population capacity changes through a transformation of civilization systems)

(3) <Material> Population in major developed or developing countries, GDP, comparison of energy consumption or carbon dioxide emissions

(4) <Material> The change of energy composition in the process of modern economic growth

(5) <Material> Population projection after 2050 (world population and that of each country)

5. Additional Key Words

Thomas Robert Malthus, modern economic growth

3) Global system and ecosystem

■ **Objective**

- Understand the structure of the earth and the major chemical elements that compose it by taking a general look at the earth's 4.6 billion year history.
- Identify diverse global scale cycles while examining geospheres, hydrospheres, atmospheres, and biospheres which compose the earth.
- Recognize the large scale transformation of the earth's ecosystems after the Industrial Revolution and the critical period a variety of regions and the whole globe are facing.

- Understand the viewpoint of ecosystems on a global scale and the concept of “ecosystem services” by learning about the Millennium Ecosystem Assessment (MA).
- Examine the ecosystem’s critical condition resulting from rapid human activity after the Industrial Revolution; consider required efforts to break through such a crisis; acquire skill or sensibility to propose concrete actions.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: The earth’s history and the structure of global systems (10 minutes)

(2) Geosphere, hydrosphere, atmosphere, and biosphere or global scale cycles (30 minutes)

(3) An evaluation of the earth from an ecosystem service viewpoint as well as the influence of human activity (30 minutes)

(4) Our possible actions to protect global systems (20 minutes)

The Points of this Class

(1) Introduction: The earth’s history and the structure of global systems

- Recognize the rapid change of global systems after the Industrial Revolution as well as ensure the understanding that the earth is an organism in which its ecosystems are considered to be significant components.
- While comprehending the concepts of global system components such as geospheres, hydrospheres, atmospheres, and biospheres, recognize that diverse cycles (thermal cycling, water cycles, atmospheric circulation, ocean circulation, material circulation, etc.) that share borders are working on a global scale.

(2) Geosphere, hydrosphere, atmosphere, biosphere and global scale cycles

- Understand the outlines and characteristics of global system foundations such as geospheres, hydrospheres, atmospheres, and biospheres.
- Comprehend the summary and characteristics of diverse cycles (thermal cycling, water cycle, atmosphere circulation, ocean circulation, material circulation, etc.) which cross the borders of aforementioned foundations.
- Consider the relationship between human activity and these cycles.

(3) The evaluation of the earth from the ecosystem service viewpoint and the influence of human activity

- View global system from the ecosystem service viewpoint.
- Through learning about Millennium Ecosystem Assessment (MA)[2] and Global Environmental Outlook 4[3] as examples of global scale ecosystem assessment, understand that the earth ecosystems have incurred rapid change through human activity, and the rate has accelerated in recent years.

(4) Our possible actions for protecting the global system

- Acquire positive outlook to address environmental issues while nurturing skills to investigate specific solutions, applying the said knowledge to elicit students' possible actions.

[2]Millennium ecosystem assessment: The integrated evaluation of the global scale ecosystem which was conducted from 2001 to 2005 and advocated by the United Nations. 1,360 experts from 95 countries collaborated. Focusing on the services the ecosystem provides, the said assessment elucidated how it is related to human well-being or how the loss of biodiversity influences the ecosystem. Thanks to these assessments, the relation of biodiversity and human life which was not clear thus far is illustrated comprehensively.

[3]Global Environmental Outlook 4: The Fourth Global Environmental Outlook (GEO4) organized by the United Nations Environment Programme (UNEP). It was released in the 20th year after the World Commission on Environment and Development (Brundtland Commission/WCED) announced "Our Common Future" (1987). GEO4 was prepared by 390 specialists around the world and checked by more than 1,000 other professionals. The report has10 chapters, 572 pages, and is a comprehensive report regarding the environment. It warns that unsolved problems such as climate change, species extinction, and food issues etc. are threatening mankind.

- While deepening the students' sense of urgency to take action based on the consideration of environmental problems, it is important that they are guided toward the awareness that these are their own problems.

2. Description of the Basic Contents

(1) Introduction: History of the earth and the structure of the global systems (10 minutes)

- Using an overview in the 4.6 billion years of the earth's history, explain that the earth is a system with its important component being ecosystems; human history accounts for just a moment in it.
- Comprehend the relationship between human activity and global systems through the understanding of rapid change of global system in an extremely short term following the Industrial Revolution.
- Grasp the concepts of components within the global system such as geospheres, hydrospheres, atmospheres, and biospheres as well as understand that a variety of cycles (thermal, water, atmospheric, oceanic, material, etc.) which crosses the borders of the aforementioned spheres are working on a global scale.

(2) Geosphere, hydrosphere, atmosphere, biosphere and global scale cycles (30 minutes)

- Understand the outline and characteristics of the components of the global system such as geosphere, hydrosphere, atmosphere, and biosphere or diverse cycles working within them. For instance, understand the water cycle through precipitation, evaporation, and transpiration from the viewpoint of water movement, such as: in soil, forest/meadows, lakes, rivers, oceans, ice, reservoirs, cities, farm land, underground water, etc. Also, understand the general circulation of

atmosphere in the troposphere including the aerodynamic flow of wind caused by orbital inclination etc.

- Understand material circulation such as the carbon cycle or nitrogen cycle from emission sources and sources of absorption.
- Though there are a variety of teaching materials which include the abovementioned contents, as "Global Environmental Outlook 4," which the United Nations Environment Programme published in December 2007, shows a comprehensive overview of the earth's environment, reviews how the earth environment was structured or has been fundamentally changed based on these according to each field - geospheres, hydrospheres, or atmospheres.

(3) The evaluation of the earth from an ecosystem service viewpoint, and the influence of human activity (30 minutes)

- Ensure clarification of ecosystems such as marine, lakes and marshes, forests, cities, etc., and demonstrate a basic knowledge of the characteristics within ecosystems such as ecological chain.
- Deepen the students' sense of urgency by giving a deeper analysis of the global environment crisis from an aspect of ecosystem while further their knowledge about the relation between ecosystems and human activity.
- As well as explaining general ideas of "ecosystem service" based on "Synthesis Report of Millennium Ecosystem Assessment (MA)," which was released in March 2005, describe that MA made it possible to comprehensively assess the function of ecosystems by adopting the concept of "ecosystem service." Explain that the general idea of "ecosystem service" is also a significant notion in "Global Environmental Outlook 4" or "Global Biodiversity Outlook 3"[4] etc.
- Elucidate that "MA Synthetic Report," "Global Biodiversity Outlook 3," and "Global Biodiversity Outlook 3" etc. each give us almost common messages and warnings as follows.
- As the result of ecosystem assessment over the last 50 years, mankind has changed the ecosystem both more rapidly and more extensively than any other comparable terms in the history. Although changes to the ecosystem brought mankind substantial benefits and economic development, these gains were attained through increased sacrifices in the form of many kinds of ecosystem degradation, risks which increase nonlinearly, deterioration of poverty for particular group of people.

[4]Global Biodiversity Outlook 3: 3GBO, A report about the state of biodiversity assessment at a global level by the Convention on Biological Diversity Secretariat. The first edition was released to assess the implementation of the convention in 2001; the second (2006) and the third edition (2010) were published to evaluate achievements.

- In the scenario of the outlook for the next 50 years, the degradation of ecosystem functions will be worsened considerably in the first half of this century, which is the impediment of Millennium Development Goals (MDGs) that is the goal of human welfare.
- It is possible to reverse the deterioration, but a large change in policies and institutions is required for that purpose. These reforms have not materialized thus far.

(4) Our possible actions for protecting the global system (20 minutes)

- In response to discussions above, consider our possible actions to be taken toward familiar or global scale crisis of ecosystem.
- Regarding materials for examination, the following are to be considered: Global Biodiversity Outlook 3, National Strategy on Biological Diversity 3, Aichi Target,[5] etc.
- Through proposing concrete actions, acquire the ability to consider and suggest specific solutions as well as nurture competence to discuss each other. Also, it is expected to enhance communication and presentation capacity through these processes.

3. Key Words for the Basic Contents

(1) Introduction: History of the earth and structure of the global system
Global system, geosphere, hydrosphere, aerosphere, biosphere

(2) Geosphere, hydrosphere, atmosphere, biosphere and global scale cycle
Circulation (thermal cycling, water cycle, atmospheric circulation, ocean circulation, material circulation, etc.), carbon circulation, nitrogen circulation

(3) The evaluation of the earth from an ecosystem service viewpoint and the influence of human activity
Ecosystems, ecological chain, Millennium Ecosystem Assessment (MA), ecosystem services, Global Environment Outlook 4, Global Biodiversity Outlook 3

(4) Our possible actions for protecting the global system
Global Biodiversity Outlook 3, Aichi Target

[5]Aichi Target: Adopted at the "the 10th Conference of the Parties to the Convention on Biological Diversity" (COP10) held in Nagoya in October 2010. It is a set of global goals composed of 20 items to be realized by 2020, such as expansion of nature preserves on land and at sea, and measures to manage the invasion of exotic species.

4. Additional Contents

(1) The concepts of geosphere, hydrosphere, atmosphere, biosphere
(2) Carbon circulation and nitrogen circulation on a global scale
(3) Trans-boundary transport of pollutants
(4) Synthesis Report of Millennium Ecosystem Assessment (MA)
(5) Ecosystem service
(6) Sub-global assessment of Millennium Ecosystem Assessment
(7) Sub-global assessment of Satoyama Satoumi (community-based forest and sea area) and Satoyama Initiative
(8) International discussion about forests

5. Additional Key Words

(1) Synthesis Report of Millennium Ecosystem Assessment

Change of ecosystems in the last 50 years, irreversible ecosystem change, future scenarios of ecosystem change

(2) Ecosystem service

Ecosystem services, support services, supply services, control services, cultural service etc.

(3) Sub-global assessment of millennium ecosystem assessment

Sub-global assessment

(4) Sub-global assessment of Satoyama Satoumi (community based forest and sea area) and Satoyama Initiative

Cluster for Satoyama assessment

(5) International discussion about forests

Declaration on Forest Principles, Intergovernmental Panel on Forests (IPF), International Forum on Forests (IFF), United Nations Forum on Forests (UNFF)

4) Resources and global capacity

■ Objective

Although available resources for mankind on earth are exhaustible, population growth and resource consumption keep increasing; resource consumption is keep exceeding environmental carrying capacity, and it has been resulting in an environmental strain. Consequently, homeostasis of the global ecosystem has not been functioning properly. Global environmental issues such as global warming, acid rain, ozone layer depletion, deforestation, desertification, and loss of biodiversity, etc. are considered to be signs of an abnormal state of global homeostasis.

In this class, firstly students will understand:

- What is the resource quantity, such as land, water, biomass, mineral, fossil fuels, etc. and how much is currently being consumed by 7 billion people?
- Human resource consumption is increasing and the standard is assessed to be 30% more than the earth's environmental carrying capacity.
- Consequently, global homeostasis is working improperly; diverse environmental issues are generated; unsustainable development continues.
- To realize sustainable development, human resource consumption standard need to be kept within a reasonable environmental carrying capacity of the earth as well as it should be realized in the situation of continuing population growth and economic development.

- For this purpose, a change in present human resource consumption is imperative before anything else can be expected to improve. Change is realized through technological innovations, reforms within the social system, adjustments in lifestyle and values, etc. Through such efforts, mankind has the potential to create a low-carbon society, a society with an environmentally-sound material cycle, or a society in harmony with nature, etc.

In this class, students will deepen the knowledge of available major resources on the earth and the changes in human resource consumption, and the fact that consumption standard rates are already over environmental carrying capacity of the earth and are causing diverse environmental issues. Likewise, students will be given an orientation to a society with an environmentally-sound material cycle, etc. while learning the skills to utilize the Global Resource Information Database[6] through the Internet as well as methods for environmental load assessment, such as ecological footprint etc. Students will develop environmentally-friendly behaviors and principals as well as being aware to keep resource consumption value within environmental carrying capacity.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: The condition of available major resources on the earth and human resource consumption (10 minutes)
(2) Excess resource consumption standard over the earth's environmental carrying capacity incurred as a result of population growth after the 20th century and economic development (20 minutes)
(3) Abnormal condition of the earth's homeostasis under an increasing environmental load (30 minutes)
(4) Efforts to realize sustainable development (30 minutes)

[6]Global Resource Information Database: United Nations Environment Programme (UNEP) started the Global Resource Information Database (GRID) in 1985, which analyzes environmental data using a Geographic Information System (GIS) and satellite image processing technology to produce comprehensive maps and printed materials so policy makers can use Global Environment Monitoring System (GEMS) data as a part of GEMS. The Global Environment Center Foundation at National Institute for Environmental Studies in Environment Agency (then) joined GRID Tsukuba Center in 1991. http://www.cger.nies.go.jp/ja

[7]Ecological footprint: A method to analyze or assess resource consumption due to human activity. It is represented as a land area that is possible to produce resources (or, in a case when calculated including fishery resources, it is represented as an inland water area) required for a person to live a sustainable life. It is called as an "ecological footprint", that is, "the measured factors negatively affecting the earth's natural ecosystem," as it could be considered as the influence of mankind on the global environment.

The Points of this Class

Because 7 billion people consume earth's limited resources, the rate of resource consumption has exceeded the earth's environmental carrying capacity, causing diverse environmental issues. To realize a sustainable society, the resource consumption standard should be kept under environmental carrying capacity, and an attempt to form a society with an environmentally-sound material cycle and a society in harmony with nature is being made.

2. Description of the Basic Contents

(1) Introduction: Outline of available major resources on the earth and human resource consumption (10 minutes)

- There are diverse resources on the earth such as land, water, plant, fishery resources, minerals, fossil fuels, etc. Currently, 7 billion people use these resources.

(2) Resource consumption standard which exceed environmental carrying capacity due to population growth and economical development (20 minutes)

- The population of the world grew from 1.7 billion in the early 20th century to 7 billion at present, and resource consumption per capita also increased through economic development.
- The resource consumption standard of our current society exceeds environmental carrying capacity by about 30%, as it is described in terms of ecological footprint.

(3) Abnormal condition of the earth's homeostasis under increasing environmental load (30 minutes)

- Though the earth has a stress tolerance for the temporal environmental load (in terms of ecosystem), homeostasis of the earth has not been working properly due to a more than 30% excess of the normal annual environmental load. Issues such increases in surface temperature, dilution of the ozone layer, acidification of rain, snow, fog, tropical forests, and grassland depletion, etc. have developed.
- Specifically, the loss of biodiversity is an irreversible phenomenon in which diverse species formed through biological evolution over 4 billion years will become extinct.

(4) Efforts to realize sustainable development (30 minutes)

- To realize sustainable development, human resource consumption standard need to be kept within appropriate environmental carrying capacity limits.
- For that purpose, the changes in human resource consumption habits are required.
- Technological innovations, reforms within the social system, changes in lifestyle and values, etc. are required.
- A combination of the review of traditional wisdom and the new technological innovation is essential.
- Through making the aforementioned adaptations, mankind aim at realizing a low-carbon society, a society with an environmentally-sound material cycle, or a society in harmony with nature, etc.

3. Key Words for the Basic Contents

(1) Resource consumption standard exceeding the earth's environmental carrying capacity due to population growth after the 20th century and economic development

global land utilization, farmland resource, grassland resource, forest resource, animal resource, fishery resource, minerals resource, fossil fuels, population growth, economic growth, resource consumption per capita, ecological footprint

(2) Abnormal condition of the earth's homeostasis under an increasing environmental load

Decrease of farmland area per capita, depletion of fishery resources, water shortage, depletion of mineral resources, reserve of fossil fuel, global warming, acid rain, ozone layer, deforestation, desertification, dissipation of biodiversity, environmental endocrine disrupters

(3) Efforts to realize sustainable development

Sustainable development, global environmental monitoring, environmental assessment, low carbon society, a society with an environmentally-sound material cycle, society in harmony with nature

4. Additional Contents

(1) Introduce environmental load indications seen in (3) besides ecological footprint as an indicator of exceeding human resource consumption over the earth's environmental carrying capacity.

(2) Give students examples which indicate that human resource consumption is approaching its limit, as seen in examples such as a decreasing grain harvest area per capita by half from 22 are (1960) to recent 10 are, with many regions now being incapable of reserving 2 tons of water resource which is required annually to supply 330 kg grains per capita, and fishery resources catch reaching a plateau after 2000.

(3) Indicate that the resource consumption standards differ largely depending on the nation, region, or income bracket, and a solution to the problem is yet to come; introduce environmental loads concepts such as ecological rucksack, food mileage, virtual water, etc; point out resource depletion or environmental pollution in developing countries to support resource consumption in developed countries.

(4) Indicate the conditions to form a society with an environmentally-sound material cycle such as Herman Daly's three "Daly Principles" for a sustainable development.

[8] Daly Principles: Herman Daly is an American ecological economist who proposed that building a sustainable society should be regarded as a paradigm of global economy. The three principles are: (1) For a renewable resource, the sustainable rate of use can be no greater than the rate of regeneration. (2) For a nonrenewable resource, the sustainable rate of use can be no greater than the rate at which a renewable resource, used sustainably, can be substituted for it. (3) For a pollutant, the sustainable rate of emission can be no greater than the rate at which the pollutant can be recycled, absorbed, or rendered harmless by the environment.

5. Additional Key Words

(1) Environmental load indicator
Ecological rucksack, food mileage, virtual water, red data book, Millennium Ecosystem Assessment

(2) Resource consumption standard limitation
Green revolution, blue revolution, hot spots, ecosystem services

(3) North-South gap in resource consumption
Globally skewed distribution of wealth, environmental refugees, negative spiral of poverty, excess capital liquidity, external development, endogenous development

(4) Sustainable development
Herman Daly's "Daly Principles", Millennium Development Goals, United Nations Development Plan

5) History of environmental measures

■ Objective
In this class, the objectives are acquiring the competence to consider the relevance between pollution issues, general history of environmental issues and actions for solutions, and one's own present lifestyle or future prospects, or the relation between world environmental issues and one's own self as well as understanding the background, cause, criteria from which pollution issues were generated in Japan and the world, spreading into global environmental issues and worsening, and measures as well as learning a lesson of how to deal with future pollution problems and environmental measures.

Within these objectives,
- Comprehend Japan's efforts: pollution issues generated during the process of establishing the modern state of the nation and a period of high economic growth, the measures such as establishment of the environmental pollution control laws or enactment of Basic Environment Law corresponding to urban and lifestyle-related pollution or global environmental issues, and continuing efforts based on Basic Environment Law.
- Understand international efforts, especially after the 1970's, to create opportunities for international discussion regarding global scale environmental solutions such as the United Nations Conference on Human Environment, and the United Nations Conference on Environment and Development (the Earth Summit/UNCED) to address the environmental issues developing world-wide due to the expansion of human activity. Also, realize international efforts, as a result these discussions, including diverse declarations or treaties which, even now, continue promoting a variety of discussions or efforts toward their own advancement.

Moreover, while acquiring a capability for thinking one's own lifestyle in relation to the causes of pollution problems, nurture the mindset to take positive action toward solutions.
This class is especially relevant to "Efforts by the government and municipality," "Efforts by corporations," and "Partnership to construct sustainable societies."

■ **Outline of the Educational Contents**

1. Basic Contents

(1) Introduction (10 minutes)

Outline of experiences and perspectives on pollution issues in Japan, the current state and future prospect of environment issues in the world, the objectives of the course, and an introduction to expected achievements

(2) Chronology of pollution issues in Japan and measures (35 minutes)

Timeline of pollution issues in Japan, and influence including measures to create solutions and effects, and socio-economic matters

(3) Generation of environmental issues and shared correspondence to them on a global scale

Chronology regarding environmental issues on a global scale and cooperative international/national correspondence and perspectives

(4) Conclusion (20 minutes)

The relevance of experience of pollution issues in Japan, the current state of environmental issues in the world, and conclusion

The Points of this Class

- Learn about Japan's experience of remarkable pollution problems serving as an example of Four Major Pollution Trial Cases and overcoming them. Understand pollution issues around the world such as acid rain or some other pollution problems which exemplify the issues in developing countries, requiring international measures to be taken. Further, global scale environmental issues such as global warming are continuing to worsen.
- Learn about Japanese pollution and environmental issues being worsened through the socioeconomic state of current economic growth and production-oriented trend, which neglects environmental concerns. Thus, serious health damages or socioeconomic loss were brought about. It is widely acknowledged that there could have been less economic damage if preventive measures were taken earlier.
- Understand that the world's industrialization advanced through a global industrial revolution. As a result, environmental issues prominent in developed countries spread on a cross-border scale, generating global environmental issues. Collaboration between developed and developing countries based on "the principle of common but differentiated responsibilities,"[9] and efforts by related organizations including individual citizens is critical.

[9]Common but differentiated responsibilities: this term is an internationally accepted concept used to describe the responsibility to solve global environmental issues; it was formed to help negotiate compromise between developed and developing countries. The former advocates that environmental issues are a problem for all mankind, and a common responsibility lies on all involved countries - developing as well as developed. The latter claims that most causes of environmental problems come from developed countries and coping skills are differentiated. In short, it is the idea that although they all share certain common responsibilities for global environmental issues, each

country's contributions and abilities to take responsible roles are different. Similar ideas existed before, but this one in particular was used explicitly in the "Rio Declaration on Environment and Development," and "Agenda 21" which was selected at the "Earth Summit" (1991), and also adopted into the "United Nations Framework Convention on Climate Change," which was selected in the aforementioned Earth Summit.

- In addition, in order to solve these problems and promote environmental preservation, it must be understood that collaboration, namely partnership, are essential among organizations including administrations, corporations, citizens, international organizations, NGO/NPOs, etc.
- Acquire the attitudes and skills to grasp specific facts from past experience as well as the present state correctly, then consider the situation from each angle to utilize the most knowledge for the development of future environmental conservation.
- Understand that environmental issues and countermeasures are linked, not only in Japan, but around the world, and grasp how one's own actions connect them to social circumstances, energy consumption, and consumption of products. Also, acquire the skill and attitude to practice recognizing that one's behavior is significant in creating environmental solutions.
- Regarding past examples and present measures, instruct students to not respond simply by stating, "Regulations should have been stricter," but to instead consider each viewpoint from all concerned parties and explore how to find the best strategy for reaching environmental preservation through regulations.
- In addition, instruct students to consider that it is important for all the relevant people including oneself to understand the situations and take measures in order to solve pollution and environmental issues.

2. Description of the Basic Contents

(1) Introduction (10 minutes)

Enhance students' interest by indicating the relevance between one's own life and pollution issues in Japan as well as global scale environmental issues, specifically through familiar phenomenon such as river water pollution, global warming, introducing newspaper or magazine articles.

Introduce the course curriculum by giving a brief summary of pollution issues in Japan, global scale environment issues, the objectives of the course, expected achievement (see 1.), the course curriculum, etc.

(2) Chronology of pollution issues and measures in Japan (35 minutes)

Summarize the following contents regarding the timeline of pollution issues in Japan and measures toward solutions, effects of the issues, and influences including socioeconomic matters.

A. Pollution in Japan, and the chronology of environmental issues and causes thereof

a. The Ashio Copper Mine Mineral Pollution Incident occurred during the Meiji era in Japan, and a citizen opposition movement followed (e.g. Tanaka Shozo's activities).

b. Many people were affected by serious health problems resulting from industrial pollution produced by rapidly developed and enlarged scale heavy chemical industries during the period of high economic growth (4 major pollution issues including Minamata disease and Itai-itai disease). Describe generations of diverse pollution issues (noise damage, vibration hazards, land subsidence, etc.) occurring parallel to such health problems. Moreover, mention the occurrence of urban and lifestyle-related pollution following the latter half of the 1970's, the destruction of nature, etc.

c. Domestic environmental policy evolved toward global sustainable development while environmental issues were internationalized through concerns such as global warming after about 1990.

B. Pollution and environmental measures in Japan

a. Thanks to the establishment of Basic Law for Environmental Pollution Control in 1967, measures to control seven typical types of environmental pollution developed under a system directly oriented to regulatory actions. In addition, Japanese style "polluter-pays principle" was introduced, which requires corporations to prevent pollution and even offers indemnification for restoration of damages. The industrial sector took action toward countermeasures while carrying out research and technological development for these.

b. The Environment Agency was established in 1971 and environmental administration was significantly advanced. (The MOEJ was newly created due to the reorganization of central government ministries and agencies in 2001.)

c. Basic Environment Law was established to address global environmental and other issues in 1993, and integrated measures were implemented according to the Basic Environmental Policy formulated under this law. Laws such as the Law Concerning the Promotion of the Measures to Cope with Global Warming, Fundamental Law for Establishing a Sound Material-Cycle Society, and Basic Policy to Preserve Biodiversity were enacted to promote efforts according to each field.

C. The result and influence of environmental measures

a. Environmental standards for some types of pollutions such as air pollution incurred by sulfur oxides, or water pollution due to hazardous substance reached to the target as a result of environmental measures. This still leaves room for improvement regarding air pollution, because nitrogen oxides from urban pollution, water pollution by organic substances or nutrients, and noise pollution are persistent problems.

b. Though it required plenty of cost and labor to take these measures, the adverse impact on GDP was small. It was reported that precautions, rather than recuperative measures, cost even less.

(3) Generation of global scale environmental issues and measures (25 minutes)
Summarize the following contents chronicling environmental issues on a global scale and the international or domestic correspondence and perspectives about them.

a. The process of the generation of environmental issues on a global scale: This phenomenon became obvious in developed countries through the advancement of industrialization following the Industrial Revolution, and then expanded to a cross-border scale.

b. International efforts toward global environmental solutions that developed into an international problem to be solved.

a) The Declaration of the United Nations Conference on the Human Environment was adopted at the conference held in Stockholm in 1972, which provided the opportunity to establish the United Nations Environment Programme (UNEP) (December 1972).

b) In the report titled “Our Common Future” by the World Commission on Environment and Development (Brundtland Commission) established under the United Nations in December 1984, the concept of “sustainable development” was set forth, which is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
c) The Rio Declaration on Environment and Development (Rio Declaration), and Agenda 21, which was established to implement various principles, etc. were accepted at the United Nations Conference on Environment and Development (UNCED/Earth Summit) held in Rio de Janeiro in 1992. The World Summit on Sustainable Development (WSSD) was held in Johannesburg in 2002 as a follow-up.
d) A variety of international efforts are made based on the United Nations Framework Convention on Climate Change, and measures to follow the objectives identified in the Kyoto Protocol such as CO2 emission reduction are likewise taken domestically.
e) Further, there are actions such as the United Nations Decade of Education for Sustainable Development (ESD) or United Nations Millennium Development Goals concerning global scale sustainable development, and recapitulation and subsequent development in UN Conference on Sustainable Development (UNCSD) or "Rio+20" Conference (2012) are likewise considered.

c. Regarding environmental issues, there is a conflict in the concept of causes and solutions (common but differentiated responsibilities) between economically rich or industrially-advanced northern nations and southern countries where national income is low and industrialization is still insufficiently under development. Continuous discussions throughout international societies are yet required.

(4) Conclusion (20 minutes)

Conclude the contents of (2) and (3), briefly reflecting on Japan's experience with pollution issues and the current state of and perspectives on global environmental issues. To reiterate these points to learn lessons, point out following matters:

- Japanese pollution and environmental issues are worsened through the socioeconomic state of economic growth, a production-oriented society, and environmental neglect, and brought serious health and socioeconomic damages. Research supports the theory that there might have been less economic damage if proactive or preventive measures were taken.
- Industrialization was advanced worldwide following the Industrial Revolution, and environmental issues which became obvious in developed countries spread on a cross-border scale, generating global environmental issues. In light of this phenomenon, collaboration between developing and developed countries based on "the principle of common but differentiated responsibilities" and efforts by all of the related organization including oneself are important to consider.
- In addition, comprehend that collaborations (cooperation principle), or partnerships, among each organization are essential. Specifically, roles expected for especially corporations such as eco-efficiency improvement or extended producer responsibility are significant.

Then, ask students questions as follows:

- How were the most appropriate responses toward environmental preservation possible in the past and present examples, and what positive steps could one take if s/he were in a position of authority?

- How should domestic or world pollution and environmental issues and measures be implemented? How are individuals and countermeasures linked, and how should one take action?

3. Key Words for the Basic Contents

(2) Chronology of pollution issues and measures in Japan

Ashio copper mine mineral pollution incident, four major pollution trial cases, Basic Law for Environmental Pollution Control, Basic Environment Law, Basic Environment Plan, Environment Agency (The Ministry of the Environment, Japan 【MOEJ】), regulatory instruments, self-motivating approach, informational approach, economic instruments

(3) Generation and correspondence of environmental issues on a global scale

UN Conference on the Human Environment, World Commission on Environment and Development, UN Conference on Environment and Development, UN World Summit on Sustainable Development, global environmental treaty, Agenda 21, sustainable development, preventive measures, common but differentiated responsibility, cooperation principle, eco-efficiency, extended producer responsibility

4. Additional Contents

It is important to experience the issues through video that introduces pollution and global environment issues, inviting lecturers who have implemented pollution countermeasures within local governments etc., or introducing pollution issues around the university.

In addition, the following matters are considered to be additional contents:

(1) Setting an environmental standard and an emissions standard, adopting total pollutant load control, and the viewpoint regarding each
(2) Law Concerning Pollution-Related Health Damage Compensation and Other Measures, or the "polluter-pays principle" and efforts according to the Law Concerning Entrepreneurs' Bearing of the Cost of Public Pollution Control Works
(3) Efforts toward proactive measures through regional environmental pollution control programs and environmental impact assessments
(4) Pollution prevention ordinances or more stringent prefectural standards, etc. and the roles of local government
(5) Achievement in pollution prevention by citizens' campaign
(6) Education for Sustainable Development (ESD) and decades of efforts by United Nations
(7) Setting Millennium Development Goal and efforts toward sustainable development
(8) Operation of International organizations such as the United Nations Environment Programme (UNEP), and assistance to developing nations through Official Development Assistance (ODA) by developed countries, World Bank etc.
(9) Promotion of the free trade system by World Trade Organization (WTO) and a claim for fair trade

5. Additional Key Words

(1) Environmental standard, emission standard, total pollutant load control
(2) Law Concerning Pollution-Related Health Damage Compensation and Other Measures, Law Concerning Entrepreneurs' Bearing of the Cost of Public Pollution Control Works, polluter-pays principle
(3) Regional Environmental Pollution Control Program, environmental impact assessment
(4) Pollution prevention ordinance, more stringent prefectural standards
(5) Citizens' campaign
(6) Education for Sustainable Development
(7) Millennium Development Goal
(8) United Nations Development Plan (UNDG), Official Development Assistance (ODA)
(9) Fair trade

【Each organization's efforts toward a sustainable society】

6) Efforts by the government and municipality

■ Objective

Regarding administrative efforts in environmental policy through government or municipalities, understand the roles of administration in environmental policy, the relationship between government and municipality, pollution/environmental issues on earth and administrative efforts for building a sustainable society, and the relationships between domestic and international efforts. Then, comprehend the present state of domestic or foreign efforts toward environmental issues to acquire the ability to think of how the issues are linked to one's own life and to sustainable development as well as understanding personal responsibility as individuals, or as a member of a principal part of society. Likewise this includes the desire to strive to acquire the competency to participate in regional policies proactively and voluntarily.

For these purposes, students must learn:

- Government/municipality plan and implement diverse environmental policies and have a large influence on social activities, taking major roles in environmental governance.
- The policy change is required from a conventional environmental policy of mainly top-down command and control type into one of other economic considerations and strategies, or participation of a variety of each independent organization.
- Each municipality is responsible for role sharing between government and municipality proceeds specifically for building a multifarious sustainable society.
- Integrated efforts are especially taken toward a sustainable society for building a low-carbon society, a society with an environmentally-sound material cycle, or a society in harmony with nature through environmental policies by the government.
- Municipalities are directly responsible to promote regional sustainable development with diverse advanced initiatives implementing the waste disposal or recycling etc. toward a society with an environmentally-sound material cycle.

Nurture the attitude to take an initiative for these issues, realizing the significance of participation and proactive collaboration between the government and municipalities regarding environmental policy.

This class is particularly related to "History of environmental measures."

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction (10 minutes)

Introduction of the efforts by government/municipality, the objectives of the course, and the expected achievement of students

(2) The role of administration in environmental policy and the relationship to the government/municipality (10 minutes)

(3) Efforts by the government for a sustainable society (25 minutes)
Efforts on the government scale for pollution problems or global environmental issues particularly to build a sustainable society

(4) Efforts by municipality for a sustainable society (25 minutes)
Efforts on the municipality scale to build a sustainable society

(5) Conclusion (20 minutes)
Efforts on the government/municipality scales, relevance to students, and conclusion

The Points of this Class

- The government/municipality plans and implements diverse policies to further the efforts toward environmental preservation: improving the relevant laws and regulations under Congress, developing social overhead capital, or formulating environmental preservation plans etc.

- Hereafter, it is required to correct the policy, which mainly consists of conventional command and control, to improve the parts that market functions alone cannot solve, through economical means. Also, diverse policies in the right direction are underway: establishing infrastructure toward sustainable development, participation of a variety of each individual organization, the policies needed to promote information disclosure for this purpose.

- Regarding allocated roles for the government/municipality, the government is basically responsible for policies concerning national administration priorities. On the other hand, issues within a municipality's ability to manage are entrusted to the decisions and responsibilities of each municipality. Utilizing the energy of each region, role-sharing is oriented toward diverse sustainable local societies.

- Concerning governmental environmental policy specifically designed for the creation of a sustainable society, as an integral effort through building a low-carbon society, a society with an environmentally-sound material cycle, or a society in harmony with nature, countermeasures are developed to realize perspectives of each society comprehensively. Other initiatives are also on the way to make material circulation in human society, including carbon, be natural and sound in accordance with great global circulation and to realize a sustainably growing and developing society as well as aiming at the goal of coexistence with nature.

- Municipalities enact fundamental environment ordinances etc. and promote sound material-cycle through means such as waste disposal or recycling as it serves directly to promote regional sustainable potentialities. Further, it implements global warming countermeasure area promotion

plans and establishes biodiversity preservation strategies. There are also examples in which information disclosure or public involvement etc. are more advanced than at the national scale thanks to residents' immediate relationship to it.

- Understand the objectives of the government/municipality to realize a sustainably growing and developing society and one's own role and responsibility, individually or as a member of principal part of a society. Then, acquire skill and the attitude to take an initiative toward environmental conservation action.

- Nurture skill and attitude to participate in the municipal policy willingly and take action.

- Particularly, while comprehending what kind of efforts universities or individuals should take toward a society with an environmentally-sound material cycle, acquire skills and the attitude to take an initiative for that purpose.

- Regarding municipality's efforts, it is to be desired to introduce local efforts, such as the issues in the area where the university stands, to recognize and examine them as familiar issues relevant to one's surroundings.

- As the role of municipality has been increasingly more crucial for environmental solutions, support students hereafter in recognizing the significance of community-based correspondence, and encourage them to take initiatives such as participating in local activities.

- Help students to recognize that the key to sustainable development is partnership with other stakeholders including administrations, citizens, and corporations, and to consider the significance of participation and information disclosure.

2. Description of the Basic Contents

(1) Introduction (10 minutes)

- First, introduce the topical environmental policy through a news article or other materials regarding efforts by the government/municipality, and deepen students' interests by indicating the relevance to their own lives.
- Introduce the machinery or role etc. of the government/municipality and so on briefly, and present lesson curriculums such as the objectives of lessons and the expected achievements of students (See 1.).

(2) The role of administration in environmental policy and the relationship between government and municipality (10 minutes)

Summarize the following contents regarding the role of administration in environmental policy or the

relationship between government and municipality. (10 minutes)

- Municipality took initiatives (such as national environmental pollution measures) to solve past environmental problems though national environmental pollution measures and systems were unimproved. Comprehend the significant roles of municipality to connect the links between residents, nations, and international societies as well as administrating directly connected to local residents' lives including local industries, under the recognition of the necessity of community-based efforts to realize earth's environmental preservation and move toward realizing a sustainable society.
- Although the basic roles of the government/municipality are determined by Basic Environment Law, it is necessary to build a policy system based on area or districts considering diverse administration fields, such as environmental policy, according to a community-driven approach to the process of decentralization through decentralization law etc.
- As a basic principal regarding the government/municipality, for example, there is the basic EU concept of, "complementary principle," which states, "matters which can be handled by basic administrative units should be done so on an appropriate scale, and wide-area administration should be involved only when necessary considering from their scale or effects."

(3) Efforts by the government toward a sustainable society (25 minutes)
In this class, understand the outline of integral efforts especially toward a sustainable society through building low-carbon society, a society with an environmentally-sound material cycle, and a society in harmony with nature.

For example, the effective contents are illustrated below:

- The process to establish Basic Environment Law (1993) which is the basic frame of Japanese environmental administration, objectives, basic principle, contents, and a summary of Basic Environment Law. In addition, Japan's Strategy for an Environmental Nation in the 21st Century was designed by the Cabinet in 2008, and Japan's aim is to build a sustainable society to overcome the global environment crisis through integral efforts toward a low-carbon society, a society with an environmentally-sound material cycle, and a society in harmony with nature.
- The Promotion of Measures to Tackle Global Warming was established in 1998 after the adoption of the Kyoto Protocol at the 3rd Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3) held in Kyoto in 1997, and efforts for a low-carbon society are being promoted. Japan intends that the Law Concerning the Promotion of Measures to Cope with Global Warming will be established with the objective to reduce 25% of greenhouse gas emissions from 1990 to 2020 for the mid-long term goals after the present commitment period (2008-2012) under the Kyoto Protocol.
- Fundamental Law for Establishing a Sound Material-Cycle Society and Fundamental Plan for Establishing a Sound Material-Cycle Society based on the formerly stated law were formulated in 2000 (The 2nd Fundamental Plan was established in 2008), and 3R principles (reduce, reuse, recycle) were promoted. Also, the Law for the Promotion of Sorted Collection and Recycling of

Containers and Packaging (Container and Packaging Recycling Law) etc. propel recycling efforts.

- The National Strategy on Biological Diversity was determined by the Cabinet (National Strategy on Biological Diversity 2010 was formulated in 2010) in response to the Convention on Biological Diversity (CBD) adopted in 1992. Thus, comprehensive measures are implemented regarding the conservation of biodiversity in Japan. The Basic Act on Biodiversity was enacted in 2008, and at The Tenth Conference of the Parties to the Convention on Biological Diversity (CBD/COP10), particularly, a new strategy (Aichi Target) to preserve biodiversity after 2011 and the Nagoya Protocol to address access to genetic resources and the equitable sharing of benefits arising out of their utilization (ABS: Access and Benefit Sharing) were adopted.
- Diverse measures such as the examination of the introduction of environmental tax laws and an emissions trade, or a strategic environmental assessment with participation from residents etc. are encouraged to help in the advance toward a sustainable society, because participation of everyone, all the members in the whole society structure, is essential in order to build a sustainable society, and the conventional regulative administration, primarily through command and control, cannot lead realize advancement.

(4) Efforts by the municipality for a sustainable society (25 minutes)

In this class, understand the environmental policy of municipality outline. In concrete terms, the following efforts are illustrated to build a sustainable society at the university location or related area. For example, a good method for learning experience to explore the administrative responsibilities of municipality is to investigate actual conditions under which university or individuals' waste is disposed or recycled.

a. Comprehend the outline of the Fundamental Environment Ordinance which determines the most basic articles regarding environmental preservation policy (enacted in all prefectures or ordinance-designed cities), and the summary of environmental measures municipality implements such as business operations of local environmental organizations.

b. In addition to measures such as waste disposal based on local Waste Management Laws, recycling etc., characteristic waste measures combined with local revitalization are implemented.

c. Each municipality voluntarily takes advanced efforts in the field of global warming measures or conservation of biodiversity such as Climate Change Policies or the introduction of emissions trading systems in Tokyo, biodiversity conservation strategies in Chiba, etc.

(5) Conclusion (20 minutes)

Summarize the contents of (2)-(4) briefly regarding efforts on the government/municipality scale.

- In environmental administration, establishing a structure for sustainable development by means of economic method, participation of diverse social organization, and the policy to promote information disclosure are required to transform from conventional policies mainly through command and control.

- Environmental administration takes place through role-sharing of the government/municipality. Hereafter, it will be more important to be rooted in localism including local revitalization etc.
- Efforts according to a government's environmental policy specifically work toward realizing a sustainably growing or developing society.
- In municipality, it is preferable to install an environmental administration best suited to the characteristics of the region, and to implement more advanced efforts than on a federal scale in information disclosure or public involvement etc.

Then, ask the following questions about the relevance to the students:
- What kind of roles should the government/municipality take toward a sustainable society? Or, how should the role-sharing proceed?
- What are problems to be solved for the realization of a sustainable society at the university location or relevant region? How are they related to the government/municipality environmental administration? What measures should the government/municipality develop?
- How should individuals or universities conduct themselves to best exemplify a low-carbon society, a society with an environmentally-sound material cycle, or a society in harmony with nature?

3. Keywords for the Basic Contents

(2) The role of administration in environmental policy and the relationship between the government and municipality

Law concerning Preparations of Related Laws for Promoting Decentralization of Power, complementary principle, localism

(3) Efforts by the government toward a sustainable society

Basic Environment Law, Basic Environment Plan, UN Framework Convention on Climate Change, Kyoto Protocol, Law Concerning the Promotion of Measures to Cope with Global Warming, The Bill of Basic Act on Global Warming Countermeasures, The Basic Act for Establishing a Sound Material-Cycle Society, The Fundamental Plan for Establishing a Sound Material-Cycle Society, Convention on Biological Diversity (CBD), The Tenth Conference of the Parties to the Convention on Biological Diversity (CBD/COP10), Aichi Target, national strategy of biodiversity, Basic Act on Biodiversity, 3R (reduce, reuse, recycle), command and control, economic instruments

(4) Efforts by the municipality toward a sustainable society

Basic Environment Code, Law Concerning the Provision of Related Laws for the Promotion of Decentralization of Power the Provision of Laws Relating to the Promotion of Power Decentralization of Power

4. Additional Contents

In this class, it is to be desired to invite authorities from the government/municipality and let them describe the policy formation process and background regarding issues, the present state of dealing with those issues, actual concrete efforts being made etc. so students can better understand the

material through a vivid depiction of the situation regarding the present state of issues and efforts.

Further, the following are considered to be additional contents:

(1) Regarding sustainable development (See History of environmental measures)
- The relationship between sustainable development and World Commission on Environment and Development (WCED/the Brundtland Commission), principles by Herman Daly, and environmental ethics
- Efforts toward sustainable development at the Rio Summit or Johannesburg Summit
- The relation to international efforts for a sustainable society
- The relevance to Agenda 21 and Basic Environment Plan

(2) Principle of Basic Environment Law and the guideline to environmental policies in the Basic Environment Plan
- circulation, harmonious coexistence, participation
- polluter-pays principle, improvement of eco-efficiency, preventive principle, the consideration of environmental risks
- policy mix

(3) Efforts regarding each matter in society
- Global warming prevention, perspective for the United Nations Framework Convention on Climate Change, precautionary principle or common but differentiated responsibilities
- Establishment of a society with an environmentally-sound material cycle, Fundamental Plan for Establishing a Sound Material-Cycle Society and resource productivity, recycling rate, targets of final waste disposal, viewpoint of regional circulation zone
- Establishment of a society in harmony with nature, Basic Survey on Natural Environment, endangered species and Red data book

(4) Efforts by community
- Environmental autonomy initiative and enactment of Local Agenda 21, the principle of “Think globally, Act locally” and perspective of Local Government for Environmental Initiative

(5) International effort by community
- Participation in the International Council for Local Environmental Initiatives (ICLEI) and efforts

(6) The outline of social infrastructure through initiative implement plans and regional comprehensive plan

5. Additional Key words

(1) Regarding sustainable development (See History of environmental measures)

World Commission on Environment and Development (WCED/ the Brundtland Commission, principles by Herman Daly, environmental ethics, Rio Summit, Johannesburg Summit, Rio+20, Agenda 21

(2) Principle of Basic Environment Law and the guideline to environmental policies in the Basic Environment Plan
Circulation, harmonious coexistence, participation, polluter-pays principle, improvement of eco-efficiency, precautionary principle, environmental risk, policy mix

(3) Efforts regarding each matter in society
Precautionary principle, common but differentiated responsibilities, resource productivity, recycling rate, targets of final waste disposal, regional circulation zone, Basic Survey on Natural Environment, endangered species, Red data book

(4) Efforts by community
Environmental autonomy, Local Agenda 21, "Think globally, Act locally"

(5) International effort by community
International Council for Local Environmental Initiatives (ICLEI)

7) Efforts by corporations and NGO/NPO

■ Objective

Demonstrate an understanding of the significance of efforts to address environmental issues, risks when efforts are not taken, and effects when efforts are taken in corporation management in the 21st century. The objectives of this class are:

- As a corporate citizen, how corporate social responsibilities (compliance, CSR: Corporate Social Responsibility) or accountability should be implemented (the ideal corporate social responsibility), consider and make conclusions regarding the current socioeconomic system in which corporations attempt to hype sales and develop, and the structures of the causes of environmental issues (ability to identify the relevance of corporative activity to socioeconomic systems, and consumer conduct.).
- Consider and summarize how one should understand the activity or efforts by corporations to help solving environmental issues, and select companies students consider when they start seeking employment. Likewise, encourage students to think about what they should consider when purchasing products (ability to evaluate efforts of corporation for environmental solutions).

For the purposes above, comprehend the history and current state of efforts for environmental solutions by Japanese corporations (big or small-medium sized enterprises), mechanisms of corporations to take environmental efforts. Likewise, demonstrate a basic knowledge of the outline to utilize tools for environmental communication etc., and learn how the increasing corporate value and

environmental issues are compatible. Further, acquire the attitude to take positive actions based on the ability to evaluate efforts of corporations when one purchases products, enters employment, makes investments etc.

- In addition, efforts toward a sustainable society are not something done only by administrations and corporations. Comprehend the following examples:
- In order to promote efforts for local environmental conservation in harmony with community-planning or regional development, participation and collaboration of people from diverse organizations are essential.
- Within the collaborated efforts of local districts or the whole country, the participation and collaboration of diverse experts or organizations are required.
- When international or cross-border initiatives proceed, the participation and collaboration of a variety of specialists or organizations are also necessary.

Learn about characteristics or activities of NGO/NPOs (Non-Governmental Organization/Nonprofit Organization[10]).

From these contents, comprehend the significance and roles of NGO's activities toward a sustainable society and acquire the initiatives to participate in and collaborate with NGO/NPOs.

[10] NGO: Though NGO was the term indicating public organizations (non-governmental) and was originally begun for use by the United Nations, it means particularly nongovernmental organizations which act internationally in many cases in Japan. Whereas, NPO is the term for organizations which conduct socially contributing activities (including within businesses) and is not intended to distribute profit to members of the organization (non-profit organization) in general. In Japan, although both terms, NGO and NPO, are used to mean almost the same thing, it is often the case that NGOs is used to emphasize that they are from private sector to government while NPOs put stress on the nonprofit aspect to corporations. Also, "a specified non-profit corporation" means a corporation which has a juridical personality according to the Law Concerning the Promotion of Specific Non-Profit Organization).
Thus, this shall be generally written as "NGO/NPO" in this Guideline.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction (presentation of environmental efforts by corporations and NGO/NPOs) (10 minutes)

(2) Environmental efforts by corporations (30 minutes)
History of environmental efforts by corporations and summary of environmental management systems,

and environmental reporting and environmental communications tools

(3) Efforts and roles of NGO/NPOs (30 minutes)
Overview of roles and diverse efforts by NGO/NPOs on local, national, and international scales

(4) Conclusion (20 minutes)
The necessity of corporations' environmental efforts and how evaluations should be conducted, and the roles of NGO/NPOs

The Points of this Class

- Understand that environmental efforts by corporations means not only voluntary efforts and social contributions but also improvement in the quality of corporate management (energy conservation, cost reduction through resource conservation, development of environmental business, etc.) and corporate image (improvement of the brand image) through historical change. Lead students to comprehend that the minimum obligations of corporations are to share dividends among shareholders, provide for employees, pay taxes, and comply with applicable laws and regulations, not simply presenting "ideal corporation images." Likewise, encourage them to consider social responsibilities and accountability of corporations as a corporate citizen.

- To promote these corporations' environmental efforts, understand that the common person's actions, such as positively evaluating corporations that take environmental efforts appropriately or sincerely, and purchasing these corporations' products are important. Thus, it is essential to acquire skills and attitudes for these purposes.

- Present examples of each organization on international, national, and local scales and let students individually comprehend what kind of organizations NGO/NPOs are, or what kind of activities they do.

- Then, understand imperative activities of NGO/NPOs to promote environmental solutions and build a sustainable society and their significant roles, and develop an initiative to support and participate in these activities proactively.

- Note to link to the next class, "Partnership for building a sustainable society."

2. Description of the Basic Contents

(1) Introduction: presentation of environmental efforts by corporations and NGO/NPOs (10 minutes)

Using environmental reports from corporations that were awarded Environmental Communication Awards[11], introduce how corporations are taking environmental efforts including their policies, objectives, structures, and actual activities (it is effective if students read some corporations'

environmental reports downloaded from the URLs and summarize comments etc. in advance). Likewise, before introducing examples of efforts by NGO/NPOs utilizing examples listed in the additional contents of the next class (students' preliminary survey of environmental efforts or activities of NGO/NPO via internet would be effective).

[11] Environmental Communication Award: A system of commendation for corporations in order to improve quality of efforts for environmental communications by businesses etc. as well as promoting efforts for aforementioned communications by awarding eminent reports on environment or environmental activities etc., and environmental TV Commercials. This award has been implemented 14 times thus far since its establishment in 1997. http://www.env.go.jp/policy/j-hiroba/report.html

(2) Environmental efforts by corporations (30 minutes)

- Summarize the following contents regarding the history of corporations' environmental efforts.
. The stage to correspond to environmental laws such as pollution regulations (regulations corresponding phase) : give consideration to the environmental issues.
. The stage to take efforts toward energy-saving and resource preservation corresponding to resource energy depletion and its soaring price (energy-saving/resource preservation corresponding phase): learn about oil shock.
. The stage to conduct voluntary environmental conservation (environmental conservation operation phase through independent correspondence): explore how the global environmental issues worsened after the 1990's.
. The stage to conduct a positive environmental management for building a sustainable society to increase the corporate values as well as realizing social responsibilities (proactive environmental management phase)

- Summarize the following contents briefly regarding the environmental management system outline.
. Describe the overviews of environmental management systems such as ISO14001, Eco-Action 21, etc. and let students recognize many corporations' initiatives for them.

- Environmental report
. Encourage students to understand that many corporations publicize environmental reports etc. and describe what kind of contents should be listed based on environmental report guidelines.

- Evaluation of products etc. and communication tools
. Explain tools such as Life Cycle Assessment (LCA), eco-label, carbon footprint, etc.

(3) Efforts and roles of NGO/NPOs (30 minutes)
- Efforts by NGO/NPOs
. Introduce the outline of diverse efforts by NGO/NPOs on local, national and international scales

with specific examples by organizations or their activities, and let students recognize a variety of NGO/NPO's extensive works.

. Comprehend what NGO/NPOs' activities mean or what kind of roles they have toward a sustainable society.

(4) Conclusion: The meaning and necessity of corporations' environmental efforts, how the evaluation should be conducted, and the roles of NGO/NPOs (20 minutes)

- Explain the concept of eco-efficiency, and the meanings of corporations' environmental efforts that improve management quality (energy-saving, cost reduction by resource conservation, development of environmental business, etc.) and lead to the formation of corporate values (improvement of brand image) etc.

- Then, ask following questions (Allow students to select questions. If students cannot summarize within the time given, submitting as a report shall be considered):

. Ask students questions as follows: As a corporate citizen, how should one take a role of corporate social responsibilities and accountability? What are the corporate social responsibilities?

. Ask students questions about the current socioeconomic system in which corporations strive to increase sales and develop, and the cause structure of environmental issues.

. Ask students how one should research corporations' website contents when job hunting and how to choose the companies to apply to, and what kinds of considerations should one take when s/he is choosing a product etc. (Recognize the importance to have one's own evaluation criteria.)

- Explain that efforts for building a sustainable society are not something administrations (governmental organization) or corporations alone can do, but the activity of NGO/NPOs is also essential.

- Then, ask questions as follows. (Allow students to select questions. If students cannot summarize within the lesson time, let them submit as a homework report.)

. Ask students what the roles of NGO/NPOs are.

. Ask students why administration or corporate efforts alone cannot complete building a sustainable society, and let them consider how individuals should support and participate in the activities of NGO/NPOs.

3. Key Words for the Basic Contents

(2) Environmental efforts by corporations

CSR: Corporate Social Responsibility, accountability, global compact, Environmental Management System, ISO14001, Eco-Action 21, PDCA cycle, environmental report, environmental communication,

environmental performance, eco-efficiency, Life Cycle Assessment

(3) Efforts and roles of NGO/NPOs
NGO (Non-Governmental Organization), NPO (Nonprofit Organization), partnership

4. Additional Contents

It is to be desired that students understand the current state of problems and current situation of intervention efforts through experiences such as inviting associate personnel to describe concrete efforts etc.

In addition, the following are considered as additional contents:

(1) The comparison and evaluation of environmental reports from multiple corporations
(2) Corporate responsibility contents in Global Warming Solutions Act, and Waste Management and Public Cleansing Law
(3) Overview of function and principle of environmental communication and contents to be reported (Environmental Report Guideline FY 2007 version)
(4) Summary of environmental accounting
(5) LCA (Life Cycle Assessment) method
(6) The contents of eco-label, environmental label, green procurement, carbon footprint
(7) Outline of the policy frame to promote corporate efforts for the environment
(8) The actual status of efforts by corporations in Japan

Students should be led in their understanding of the current state of environmental issues and efforts through experiences through inviting associate personnel of NGO/NPOs involved in relevant activities to illustrate concrete efforts, etc.

In addition, the following are considered as additional contents:

(1) The comparison of efforts of NGO/NPOs between Japan and foreign countries (especially Europe and America)
(2) The problems to be solved in NGO/NPO activities in Japan (specifically in funds and human resources etc.)

5. Additional Keywords

(2) Corporate responsibility contents in Global Warming Solutions Act, and Waste Management and Public Cleansing Law
Global Warming Solutions Act, Waste Management and Public Cleansing Law
(3) Overview of function and principle of environmental communication and contents to be reported (Environmental Report Guideline FY 2007 version)
Environmental Report Guideline

(4) Summary of environmental accounting

Environmental accounting

(6) The contents of eco-label, environmental label, green procurement, carbon footprint

Eco-label, environmental label, green procurement, carbon footprint

【Partnership to construct sustainable societies and conclusion as a whole】

8) Partnership to construct sustainable societies

■ Objective

Recognize the significance of partnership with different organizations, why diverse forms of partnership is important for building a sustainable society, based on students' own sense of value and point of view.
Realize familiar partnerships through understanding "examples of partnerships for building a sustainable society" which are already known to students.
Comprehend about several caution or important points to make partnership to be actually meaningful and effective through a couple of principles.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction (20 minutes)
Practice: "What is partnership?"
Time for "tuning" to share the students' concepts/ideas of "partnership"

(2) Development (40 minutes)
Practice: "What is partnership for building a sustainable society?"
Further, while presenting examples of "partnership for a sustainable society" as the core part of this 90 minutes, exchange ideas about partnership in groups.

(3) Conclusion (30 minutes)
Lesson: "To promote the partnership of corporations, administrations, NGO/NPOs etc. toward building a sustainable society"

In the end, describe "partnership between corporations and environmental NGO/NPOs" and "partnership between administration and citizens' organizations."

The Points of this Class

In this class, regarding partnership among corporations, administration, and NGO/NPOs, students' own consideration about ideal partnership and problems should be emphasized as well as their knowledge of actual examples and concrete efforts. For this purpose, the lesson will proceed on students' discussions specifically with the core part being workshop style.
Toward building a sustainable society, comprehend that collaboration of a variety of organizations can reach goals more successfully and take efficient and effective efforts as well as collaboration between

diverse organizations are essential. Likewise, understand that NGO/NPOs can be at the core of these efforts and collaborations. Then, acquire the initiative to proactively participate in NGO/NPO activities.
Further, in the case when students join corporations or administrations in the future and take efforts through partnership (collaboration) with NGO/NPOs, or take efforts as NGO/NPO, it is also important to understand the principles of mutual respect, acceptance, and complementation.

2. Description of the Basic Contents

Introduction: Recognize a variety of already existing partnerships in the world. At the same time, comprehend diverse forms of partnerships aiming at the goal of building a sustainable society.

Development: Through discussion to explore students' opinions regarding promotion of partnerships, make students aware of their own values of the possibilities and difficulties of partnership (collaboration) between different organizations.

Conclusion: Although there are 2 principles from past lessons presented here, teachers should talk about the possibilities and difficulties within partnerships by sharing their own experiences rather than focusing on kinds of obstruction. Note that time must be taken to consider students' comments.

(1) Introduction (20 minutes) practice: "What is partnership?"
Time for "tuning" to share/explore the students' concepts of "partnership"
・Individually, list more than 10 translations of "partnership" in Japanese. (5 minutes)
・Form groups of 3-4 people and share lists from (1). Then, summarize the concepts of "partnership" into 3 Japanese words per group. (10 minutes)
・Presentation of the summarized words to the class. (5 minutes)

(2) Development (40 minutes) practice: "What is partnership for building a sustainable society?"
Further, while presenting examples of "partnership for a sustainable society" which is the core part of this 90 minutes, groups exchange ideas regarding partnership.
・Share opinions in the same groups regarding all the possible sectors, what kind of sectors are considered to be the main constituents of partnership for a sustainable society. (5 minutes)
・Choose examples of familiar partnership groups from aforementioned examples. Share examples in the form of, "a project called 'ZZZZ' through the partnership of XX and YY." (15 minutes)
・Introduce aforementioned examples to the class and include additional information from the teacher.

(3) Conclusion (30 minutes) lesson: "To promote partnership between corporations, administrations, and NGO/NPOs for a sustainable society"
・This lesson is based on the following "example of a partnership (collaboration) principle between corporations and NPOs" and "an example of a partnership (collaboration) principle between administrations and citizen's organizations." (10 minutes)

■ An example of a partnership (collaboration) principle between a corporation and an NPO
“5 articles to promote collaboration between corporations and environmental NPOs”
1. (Purpose)
After confirming what each organization is intended to do, create common major goals and share among all those concerned.

2. (Story)
Start with storytelling (time, place, structure, and plot) to realize the objectives in advance, and set trial period.

3. (Mutual understanding)
Promote information disclosure such as originality, specialty, and the budget and settlement accounts, and make efforts to deepen mutual understanding from equal perspectives.

4. (Mutual evaluation)
Make common standards of value to evaluate each other, and implement mutual evaluation openly on any occasion.

5. (Accomplishment)
Share accomplishments and receive criticism and praise together, and pay the NPO adequate compensation.
(Source of reference: Japan Environmental Education Forum Kiyosato Meeting 2007, workshop report, “Strategy meeting to promote collaboration of corporations and environmental NPOs”)

■ An example of a partnership (collaboration) principle between administration and citizens’ organizations
“Collaboration principle: Basic policy regarding collaboration with social activity in Yokohama (Yokohama code)”
When society and administration collaborate, promote it according to the following 6 principles:

(1) Principle of coordination (civil movement and administration should stand on even ground.)
(2) Principle of respect for autonomy (Independent civil movement should be respected.)
(3) Principle of self-sustainability (Collaboration should be promoted to guide civil movement toward independence.)
(4) Principle of mutual understanding (Social movement and administration would reach mutual understanding regarding advantages, disadvantages, and standpoint.)
(5) Principle of sharing purposes (Social movement and administration should share all or a part of goals regarding collaboration.)
(6) Principle of disclosure (The relationship between social movement and administration should be disclosed in public.)
(Source of reference: partly from “Yokohama Social Movement Promotion Exploratory Committee

Report” (March, 1999))

・In addition, tell students that the process of these partnerships is itself a hands-on participation style of learning. (10 minutes)

Here, the teacher should describe how each independent organization can learn and grow while exemplifying partnership from actual knowledge (or actually being involved in a partnership if possible).

・Answer students’ questions regarding contents throughout the lesson. (5 minutes)
・Write a report to review (or reaction) on this lesson. (5 minutes)

(If there is still some time, read and share each other’s written reports in groups of 3-4 people. Even if there is no time to share, writing the report is a chance to gauge the depth of each learner’s understanding of the teacher as well as useful for deep understanding.)

3. Key Words for the Basic Contents

■ Collaboration principle example between corporations and NPOs
Five common aspects (purpose, story, mutual understanding, mutual evaluation, accomplishment)

■ Collaboration principle example regarding administration and citizens’ organization
Six principles (coordination, respect for autonomy, self-sustainability, mutual understanding, sharing purpose, disclosure)

4. Additional Contents

Hereafter, the oldest meeting, “Japan Environmental Education Forum Kiyosato Meeting,” which strives to give partnership opportunities in the environmental field “exchange forum,” is introduced as well as a specific partnership example.

■ Example introduction for environmental conservation through the partnership between incorporated foundation Kiyosato Educational Experiment Project (KEEP) and multiple corporations
- Bridges to connect wooded areas above roadways which cross Yatsugatake woods “Animal Pathway” -

“Animal Pathway” means suspension bridges temporarily formed above roadways for arboreal animals. This describes the empirical research and development project of “Animal Pathway” about the Japanese dormouse (near threatened species, natural monument), Japanese squirrel, small Japanese field mouse (*Apodemus argenteus*), etc. to prevent foraging and reproductive disorder or degradation of genes caused by fragmentation of the forest due to artificial structures such as roads or railways.
The “Animal Pathway Research Society” started its activity in January 2004. Its management

centers upon the Kiyosato forest in Hokuto-shi (city) Yamanashi-ken (prefecture) through collaborations between 4 corporations starting from the “Japanese dormouse conservation and research group” presided by the “incorporated foundation Kiyosato Educational Experiment Project (KEEP) Yamane (dormouse) museum,” “Taisei construction corporation,” “Enwit Co. Ltd.,” and “Nippon Telegraph and Telephone East Corporation” (Hereafter, NTT East), and voluntary individuals. The characteristics of this research society comprise collaborations of role-sharing through utilizing each group’s expertise or technique.

As main role-sharing, biological research and knowledge of small arboreal animals and overall management are provided by Yamane Museum, Taisei Construction and Shimizu Construction, which designed and constructed the structures, Enwit Co. Ltd. and Taisei Construction, which adjust and operate monitoring equipment, and NTT East, which offered the materials. As a result of this collaboration and the local Hokuto-city’s supply for the construction cost by 2010, they could build two “Animal Pathways” on public roads. They also provide 24 hour visual monitoring systems, and the first one was confirmed to be used approximately more than 800 and dozens of times. Based on the results, they are developing promotions to spread the installment both domestically and internationally. This was awarded the Japan Society of Civil Engineers (JSCE) Award in the year 2007 (May 30th, 2008) and the MOEJ Award (June 19th, 2010) at 2010 the 1st Ikimono (the creature) Nigiwai (prosperity) Corporate Activity Contest. In addition, Animal Pathway Research Society conducts activity with the support of the Keidanren Committee on Nature Conservation.

■ Example introduction of exchange forum as an opportunity to encounter each other = a stage before forming partnerships with NGO/NPOs, corporations, administration, and universities

- ”Japan Environmental Education Forum Kiyosato Meeting” which has been held continuously for 24 years -

Japan Environmental Education Forum is the oldest and largest scale environmental education network, and it started as “Kiyosato Environmental Education Forum” in 1987. Approximately 200 people with diverse backgrounds who are concerned about environmental education exchanged their experiences and information at the “Kiyosato Environmental Education Project (KEEP)” site in Yamanashi prefecture. As a result, various kinds of collaborations beyond the standpoints were formed through the opportunities in this forum.

Kiyosato Environmental Education Forum started with the goal of creating an environmental education network beyond sectors in 1987. First, it was decided to continue for 5 years, aiming at holding an annual exchange forum once a year and publishing the report in the 5th year, its systematization was not planned at first. After accomplishing the publication in 1992, “Japan Environmental Education Forum” was created with the recognition of the needs of formation to continuously connect organizations, and it became an incorporated association subsequently. This forum conducts collaborations with the largest number of corporations in environmental education fields and performs the function to coordinate them.

9) Conclusion: For construction of sustainable societies

■ Objective

As the result of learning diverse aspects of environmental issues through taking this course from the first lesson based on this Guideline, students should have grasped the overview of environmental issues. In this lesson as a “conclusion,” first review that these environmental issues have complex structures which include diverse factors, and ensure that it requires not a “solution” as an extension of “linear thinking” but the reformation of the social system itself (both hard and soft aspects) composed of these elements to solve the problems. It could be said that the approach to address environmental issues is itself has something common with the trend of building a sustainable society.

In this “conclusion” lesson, the objectives are: (1) to review the history of global scale environmental measures dealt with in “5. History of environmental measures” in this chapter, and consider how sustainability and its principles could be treated with in it (2) Summarize how the structures of problems look like when they are considered as systems from a bird's eye viewpoint objectively for each class in lesson number 2-8 (how natural scientific, technical, economic and social factors are related), (3) When dealing with environmental issues, understand that observing not only “environment” but also economic or social elements leads to building a sustainable society, (4) Identify international activities toward a sustainable society, especially what kinds of specific movements are there to address climate change, biodiversity, and ESD, and (5) Provide students motivations to be more proactive for building a sustainable society through their consideration of how one can contribute to sustainability improvement from his/her own expertise.

Further, this “conclusion” lesson’s objective is to let students realize the change in their own way of thinking through conducting anew the work which was done at the first “introduction” lesson in order to understand that each individual environmental problem includes diverse elements after learning about a series of issues.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction regarding the concept of “sustainability” (20 minutes)

Review regarding the philosophy of “sustainability”

(2) Formation of a bird's eye viewpoint (30 minutes)

Present some of the diverse environmental issues dealt with from the 2nd to 8th lessons in this subject, and let students discuss how these structures could be organized from a bird's eye viewpoint of the abovementioned “sustainability philosophy.”

(3) The present state of sustainability (20 minutes)

An explanation regarding international activities toward a sustainable society

(4) Academic expertise and environmental issues/sustainability (10 minutes)

Discuss where student's standpoint of his/her own expertise is with regard to the goal of building a sustainable society, and how they can contribute to sustainability.

(5) Conclusion of the lesson (10 minutes)

The Points of this Class

The important points of this class are to put together diverse kinds of knowledge learned through the lessons thus far into a key word, "sustainability," and develop an attitude to try to see them as a whole. Likewise, encourage students to consider sustainability in terms of one's own area of specialization or occupation, and to realize their possible contribution to sustainability in diverse settings and from various standpoints.

2. Description of the Basic Contents

(1) Introduction regarding the concept of "sustainability" (20 minutes)

a. First, as a recapitulation of the lessons thus far, tell students that the concept of "sustainability" will be used anew in this lesson.

b. Then, introduce a brief history regarding the principle of "sustainability." Namely, take a general view of what was discussed and agreed to in the following meetings: 1972: Declaration of the United Nations Conference on the Human Environment, 1987: Our Common Future, 1992: Rio Summit (Agenda 21), 2000: MDGs, 2002: Johannesburg Summit (ESD, etc.). Comprehend efforts for environmental issues largely related to the formation of global frameworks systems to implement a sustainable society. (However, note that the center of the sustainability problem lies not only in environmental issues but also in the population problem at its roots and some theories consider poverty problems to be rather serous.)

(2) Formation of a bird's eye viewpoint (30 minutes)

a. Introduce sustainability, which is considered to be established in the discussion of "Agenda 21" process, in terms divided into "environmental sustainability," "economic sustainability," and "social sustainability."

b. After the second lesson of this program, present some of diverse environmental issues treated thus far, and let students discuss how these structures are organized in light of the aforementioned "sustainability principle" and from a bird's eye viewpoint. Depending on how the arrangement is, it is possible to take more time in this discussion part in b with participation from teachers that were in charge of the lessons thus far, and make it a conclusion class. One method is to write down headings such as "environment," "society," and "economy," and categorize how the contents are classified (not a big topic such as "global warming" or "biodiversity," but individual phenomenon, problem, and measures in each theme).

(3) The present state of sustainability (20 minutes)

a. Indicate examples of diverse movement in the world toward a sustainable society from the teacher's field of expertise.

b. For instance, talk about the following matters, mainly implemented strategies or formulated plans assuming a sustainable society excluding topics students have already learned: the activities of United Nations regarding ESD, the implementation of a community-based new economic system (micro finance) at Grameen Bank, global action such as COP regarding global warming or biodiversity, the adoption and multilateral uses of the smart grid as a new energy information system in technical fields, etc.

(4) Academic expertise and environmental issues/sustainability (10 minutes)
a. Discuss student's standpoint of his/her own expertise with the goal of building a sustainable society, and how they can contribute toward sustainability. For example, distribute paper (A4 size) and let students write down their own expertise (if decided) or the occupation they want to pursue, and list how the field of expertise/occupation are related to sustainability in each category of environment, society, and economy, or other areas derived from these, and their possible approach for contribution for it. Even if they are technical occupations, descriptions regarding only techniques should not be accepted (vice versa), and students should endeavor to have a bird's eye viewpoint.

b. If there is still time, let students explain a couple of their answers.

(5) Conclusion of the lesson (10 minutes)
a. Answer questions from students.
b. The definitive message for students should be that the course of the world is to realize changes from the accumulation of considerations in a gradual manners regarding sustainability when diverse scaled decisions are made (such as family council, a decision of one section in a corporation, municipality policy, an action plan of NPO, national strategy, bilateral negotiation, creating a international framework, etc.).

3. Key Words for the Basic Contents
Although "sustainability" is the main key word for this class, see key words in each class thus far regarding individual contents.

2. Reference Class

【Itemized discussions on environmental issues】

1) Global warming, energy and countermeasures

■ Objective

Understand that there are extremely complex structures regarding global warming, and they are closely linked to our diverse activities. Then, as the knowledge to be acquired next, first plan to understand basic matters about global warming. Develop human resources that have the following knowledge and abilities to discuss what each region or organization should do with related organizations.

・Understand the scientific knowledge regarding global warming (scientific mechanism which causes global warming) and the characteristics of global warming which is a current problem, etc.

・Comprehend the influence the progress of global warming has globally, and on Japan. Referring to the Stern Review (The Economics of Climate Change) etc., understand the necessity and rationality of global warming measures through the comparison of the estimate of the cost for the measures in the case when the measures are taken and the assessment of damage when the measures are not taken.

・As global warming measures, realize the significance of adaptation efforts to relieve greenhouse gas impacts as well as the mitigation for emissions control of greenhouse gases.

・Take a general view of the outline of diverse global warming solutions including technical measures such as creating energy and home insulation and social system measures such as emissions trading, and develop basic knowledge, and acquire basic knowledge for examining possible actions of each region and organization.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: Overview of historical progress of discussions regarding the global warming problems (10 minutes)

(2) Scientific knowledge regarding global warming problems (mechanism of global warming and environmental influence) (30 minutes)

(3) Diverse global warming prevention measures and the influence on the economy (30 minutes)

(4) Global warming prevention measures appropriate for each region and organization (20 minutes)

The Points of this Class

(1) Introduction

- Understand that global warming is an extremely complex phenomenon related to our diverse activities as well as overview the historical progress of discussions regarding global warming. Likewise, grasp the outline of diverse opinions and views about global warming including pros

and cons.

- Comprehend the confrontation between developing and developed countries, a discrepancy between industry and environmental groups, and a variety of different opinions in internal industry as well as specifically overview the timeline and main issues of global negotiations from identification of problems in the 1980's, the United Nations Framework Convention on Climate Change, Kyoto Protocol, and to current Post-Kyoto negotiation.

(2) Scientific knowledge regarding global warming problems

- Demonstrate a fundamental understanding regarding scientific mechanisms and characteristics of global warming, and its influence etc. This should include not only a superficial understanding but also the understanding of why they are problems and what kinds of correspondences are required to solve them.

(3) Diverse global warming prevention measures and the influence on the economy

- Understand diverse frameworks of global warming prevention measures and the outline of each measure including technical measures and society system solutions.
- Comprehend the summary of discussions thus far about economic impact regarding global warming prevention measures including both positive and negative influences.

(4) Global warming prevention measures which are appropriate for each region and organization

- Develop the initiative to take action proactively as well as acquire the concept to choose or utilize selection methods and standards necessary to take suitable measures for specific areas or stakeholder groups from diverse global warming prevention measures selections.

2. Description of the Basic Contents

(1) Introduction (10 minutes)

Overview the following points regarding global warming

- Understand through an overview of the global warming mechanism that global warming comprises extremely complex phenomena which are closely linked to our lives in diverse ways.
- Explain the chronology of global negotiations from problem identification to the Post-Kyoto negotiations regarding the timeline from the United Nations Framework Convention on Climate, Kyoto Protocol, and to Post-Kyoto negotiations and major arguing points from international negotiations; the differences in the standpoints and opinions among EU, Japan, America, etc. and the backgrounds.

. Discussions about climate change issues in the 1980's (the conflict between developing and developed countries)

. United Nations Framework Convention on Climate

. Kyoto Protocol negotiation

. The implement of Kyoto Protocol

. Negotiations toward Post-Kyoto

- Describe the conflict between developed countries, who assert that a collaborated global effort

is essential to solving environmental problems, and developing countries, who believe that greenhouse gas emissions by developed countries caused today's global warming. Likewise, explain the "common but differentiated responsibilities" concept that was agreed upon as a product of compromise, etc.

- Interpret the scientific mechanism of global warming issues and the summary of diverse opinions about global warming's influence.
- Introduce the following discussions about major arguing points regarding global warming prevention measures and economic influences: the opinion that conventional global warming prevention measures have a bad influence on economy, discussion claiming that global warming prevention measures are extremely small compared with the expected amount of damage, argument asserting that global warming prevention measures create new industry and employment.

(2) Scientific knowledge regarding global warming problems (30 minutes)

- Describe the main points in Summary of IPCC 4th assessment report (1st working group's report). Specifically, elucidate the fact that global warming is certainly progressing and the significant change being generated during this extremely short period is a particular problem from the viewpoint of the earth's history.

・The mechanism of global warming and the type of greenhouse gas

・The amount of greenhouse gas emissions after the Industrial Revolution, the change in atmospheric concentrations of CO2

. The greenhouse gas emissions amount by country

. The inertia of global warming and the inescapable progress of global warming

. Describe the main points of Summary of IPCC 4th assessment report (2nd working group's report) regarding adaptation measures which are considered to be major environmental impacts caused by climate change. Particularly, understand that global warming effects are already observed in various regions and to consider adaptation measures is critical as global warming will progress inevitably for decades hereafter. Likewise, intensively describe the adaptation measures menu and priorities including disaster prevention and water resource measures.

. Major effects from global warming (affecting human health and ecosystem, disaster, sea level rise, etc.)

. Explain so that students can examine beyond superficial understanding and be able to make an appropriate counter charge to the arguments, for example, that there was a large scale temperature rise thus far or the earth's temperature is changing to a cooling trend based on time scale of the change etc.

(3) Diverse global warming prevention measures and the influence on the economy (30 minutes)

- Explain Summary of IPCC 4th assessment report (3rd working group's report) and Stern Review (The Economics of Climate Change) about technical potentials and the economic influence to adopt these regarding the climate change prevention measures.

- Overview the climate change prevention measures in Japan including energy saving measures in the Japanese industrial world after the Oil Shocks in the 1970's and the Action Program to Arrest Global Warming (1990) etc., and illustrate the change of the greenhouse gas emissions amount on the whole of Japan and the characteristics in that of each sector.
- Analyze the details of emissions in civilian sectors and transport sectors and explain the reduction potentials in these sectors from both technical and social system aspects.
- Describe diverse policies to promote climate policy measures in Japan including the Kyoto Protocol Target Achievement Plan, the Basic Act on Global Warming Countermeasures Bill, environmental tax, emissions trading, discussion regarding Feed-in Tariff of new energy, etc.
- Interpret that the climate change prevention measures do not necessarily cause negative effects on Japanese economy but it is linked to new business opportunity or employment, and especially significant business opportunities are expected through international development.
. Diverse adaptation measures considered to reduce the climate change impact and the situation of implementation
. The greenhouse gas emission amount by sector and type of gas in Japan and their historical changes
. Technical potential toward the reduction of greenhouse effect gas emissions in Japan
. Institution and social system toward the reduction of greenhouse effect gas emissions in Japan
. What the calculation result of the economic model means and limitations of the model
. Future prospects of climate change prevention measures in Japan

(4) The global warming prevention measures appropriate for each region and organization (20 minutes)

- As it cannot be said that the same measures for all people are the most effective in implementing climate change prevention measures, consider the viewpoints to be pondered and standards for choices when selecting measures, and how to choose the appropriate measure for each region and individual organization from the menu of a variety of global warming prevention measures leaned thus far. Likewise, nurture the ability to choose the appropriate measures through examination of the realistic and effective measures suited for each situation when discussing with specific regions or main constituents hereafter. In addition, review the process toward forming consensus for such measures.

3. Key Words for the Basic Contents

(1) Introduction

The United Nations Framework Convention on Climate Change, Kyoto Protocol, Post-Kyoto negotiations, confrontation between developed and developing countries

(2) Scientific knowledge regarding global warming problems

Summary of IPCC 4th assessment report (1st and 2nd working groups' report), environmental impacts of global warming, adaptation measures, impacts on global warming in Japan, opposition against measures to address global warming

(3) Diverse global warming prevention measures and the influence on the economy
Summary of IPCC 4th assessment report (3rd working group's report), technology options on mitigation measures, Stern Review, Kyoto Mechanism; joint implementation, emissions trading, Clean Development Mechanism (CDM), environmental tax, economic models for economic impacts of mitigation measures, the Act to Address Global Warming, Kyoto Protocol Target Achievement Plan, Basic Law to Tackle Global Warming

(4) The global warming Prevention measures appropriate for each region and organization
Inventory of greenhouse gas emissions, sectoral greenhouse gas emissions, mid and long-term road map to tackle global warming

4. Additional Contents

(1) Scientific mechanism of global warming (IPCC 4th assessment report 【1st working group's report】)
(2) Environmental impacts of global warming (IPCC 4th assessment report 【2nd working group's report】)
(3) Overview of global warming prevention measures (IPCC 4th assessment report 【3rd working group's report】, Stern Review regarding global warming prevention measures)
(4) Environmental impacts of global warming on Japan (environmental report about global warming impact on Japan)
(5) Mid and long-term road map to tackle global warming
(6) Influence of global warming prevention measures on Japanese economy (new growth strategy)
(7) Basic Law to Tackle Global Warming
(8) Basic Energy Plan formulated in 2010

5. Additional Key Words

(1) Scientific mechanism of global warming
Long-term trends of global warming, frequency of disasters, major greenhouse gases, air pollution and global warming

(2)Environmental impacts of global warming
Symptoms of global warming, disaster, change in precipitation patterns, impact on water resources, impact on ecosystems

(3) Overview of global warming prevention measures
Contributions to climate change in developed and developing countries, technological potential of the climate change mitigation measures, economic impacts of the climate change mitigation measures, co-benefits approach

(4) Environmental impacts of global warming on Japan

Frequency of disasters, impact on water resources, impact on forestry ecosystems, impact on crop production, health effects

(5) Mid and long-term road map to tackle global warming
Renewable energy, nuclear power, zero-emission house, electric car, etc.

(6) Influence of global warming prevention measures on Japanese economy (new growth strategy)
New business opportunities, 1.4 million employment generation, overseas businesses on climate change

(7) Basic Law to Tackle Global Warming
25% reduction in 2020, environmental tax, domestic emissions trading, renewable energy fixed price buyback program)

(8) Basic Energy Plan formulated in 2010
30% reduction goal in 2030, smart community

2) Air pollution and countermeasures

■ **Objective**

- Comprehend the research results that prevention of air pollution has more economic rationality by far than reactive compensation based on the history of serious air pollution in Japan and countermeasures to overcome them regarding air pollution issues and policies.
- Summarize the atmospheric environment issues which are growing into a major challenge mainly regarding aerosol, tropospheric ozone, methane, black carbon, etc. Likewise, overview the necessity of collaboration with these measures based on trends in international treaty regarding POP_s[12] and mercury pollution control.
- In addition, the policies to address global scale atmospheric environment issues individually thus far such as regional air pollution, transboundary air pollution, stratospheric ozone layer protection, and global warming problems are meeting their limitations. Thus, understand that more comprehensive and integral atmospheric environment control is required based on historical development from the Convention on Long-range Transboundary Air Pollution in Europe and recent research results which shows that transboundary air pollution is becoming a problem on a global scale.
- Demonstrate an understanding of basic topics regarding the co-benefits approach[13] which is an integral approach of air pollution and climate change measures etc. as the concrete measures to be considered, for example.

■ **Outline of the Educational Contents**

1. Basic Contents

(1) Introduction (10 minutes)

(2) Air pollution problems and countermeasures in Japan (30 minutes)

(3) Progress toward a comprehensive atmospheric environment control including transboundary air pollution problems (30 minutes)

(4) Air pollution and global warming problem (20 minutes)

The Points of this Class

(1) Introduction

- Describe the outline of the lesson.

(2) Air pollution problems and countermeasures in Japan

- Recognize past heavy air pollution problem occurrences and many victims in Japan as seen in Yokkaichi Pollution Lawsuit.
- Understand the importance of prevention as it has more economic rationality by far than reactive compensation according to an economic analysis result regarding the cost for past air pollution prevention measures and compensation for victims.
- Comprehend the significance of Japan's global contribution to air pollution control through the experiences, and acquire proactive attitudes toward international collaboration activity.
- Build a bridge to learn the significance of integral air pollution prevention measures as well as recognizing atmospheric environment issues, which are becoming a new challenge.

[12]POPs (Persistent Organic Pollutants): It means persistent organic pollutants which have toxicity, refractory, bioaccumulation, and long-distance mobility.

[13]Co-benefits approach: The method to implement climate change prevention measures while promoting efforts contributing to sustainable development in developing countries at the same time. The goal of this method is to solve both of the climate change prevention measures, which is global scale issues, and domestic or local scale issues (such as serious environmental problems) in developing countries in which major concerns are realization of economic and social development, and confronting environmental issues.

(3) Progress toward a comprehensive atmospheric environment control including transboundary air pollution problems

- Understand the bounds of conventional measures which address individual substances or gases through specific examples.
- Comprehend the world trend toward comprehensive air pollution measures as illustrated through concrete examples. Also, recognize comprehensive air pollution measures becoming increasingly significant in keeping with POPs Treaty or the international negotiation regarding the Treaty on Mercury Reduction.

- Identify air pollution issues deeply connected to global warming prevention measures.

(4) Air pollution and global warming problem
- Recognize air pollution's close relationship to global warming prevention measures which create the need to consider both as a unit henceforward.
- Identify a certain kind of air pollution gas whose reduction causes an increase in greenhouse effects.
- On the other hand, understand that some kinds of air pollution substances are effective as global warming prevention measures, having a strong influence in the short term due to a short life span in the atmosphere in addition to the size of the greenhouse effect.
- Understand methods to deal with air pollution and global warming as they relate to each other, especially from a co-benefit approach.

2. Description of the Basic Contents

(1) Introduction (10 minutes)
- Explain the outline of the lesson and the following important matters to be learned:

. Prevention measures are more effective and cost less than reactive damage control.

. The significance of Japan's international contribution to air pollution control utilizing past experiences.

. The most effective measures should be considered based on a view of air pollution substances on the whole, rather than addressing diverse air pollution prevention measures individually.

. The increasing necessity to consider air pollution and the climate change prevention measures as a unit.

(2) Air pollution problems and countermeasures in Japan (30 minutes)
- Explain the occurrences of past serious air pollution problems and the many resulting victims including those involved in the Yokkaichi Pollution Lawsuit and let students have a new understanding.
- Through exploring economic analysis results regarding countermeasure costs for past air pollution problems such as "Japan's experience of air pollution" and compensation for victims, realize prevention measures to be economically more rational by far than reactive remedial measures including quantitative indicators.
- In order to not repeat Japan's failure, introduce the significance of spreading air pollution measures utilizing Japan's experience in developing countries and other concrete examples of efforts in Thailand, Mexico, China, JICA, etc.
- Describe the overview and direction of efforts regarding air pollution issues which are becoming increasingly serious in recent years such as Particulate Matter (PM) and tropospheric ozone.

. Transition of air pollution

. The system of the Air Pollution Control Law (including environmental quality standard, emission standard, and total pollutant load control)

. Pollution-related Health Damage Compensation Law
. Historical change in investments of industries on environmental pollution control
. Air pollution problems in recent years
  . International collaboration in the field of air pollution

(3) Progress towards comprehensive atmospheric environment control including transboudary air pollution issues (30 minutes)

Explore the necessity of comprehensive air pollution measures through the following topics:

- Explain the history of progress in measures according to the Convention on Long-Range Transboundary Air Pollution in Europe and the transition from addressing individual substance measures into comprehensive air pollution measures in Europe particularly through Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (the Gothenburg Protocol, 1999).
- Prior to that, describe the promotion in accumulation of scientific knowledge in Europe toward comprehensive atmospheric environment control through RAINS Europe[14] and its outline.
- Explain that global scale supra-regional efforts are required through reviewing the efforts to manage transboundary air pollution problems being generated newly including acid rain, haze in southeast Asia, dust and sand storm (DSS) in eastern Asia, Atmospheric Brown Clouds (ABCs) in the Indian subcontinent, etc.
- Explain the future need for fundamental revisions to environmental policy including a restructure of the Japanese legal system, as it does not currently correspond to these new international trends. Encourage students to consider what kinds of reforms are essential.

. Convention on Long-Range Transboundary Air Pollution in Europe and Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol)
. Comprehensive atmospheric environment model (RAINS Europe, etc.)
. Efforts for transboundary air pollution including acid rain
. Newly emerging air pollution issues such as dust and sand storm (DSS)

(4) Air pollution and global warming problems (20 minutes)

- Identify short-lived climate forcers (SLCFs) such as black carbon, tropospheric ozone, and methane to also be global warming solutions with significant effects in the short term.
- On the other hand, as many kinds of aerosol including sulfur oxide have a cooling effect, describe co-control required which also reduce greenhouse gas, simultaneously promoting reduction measures so as not to result in the acceleration of global warming.
- Explain that many kinds of effective measures for global warming (efficient use of energy, etc.) are also available as air pollution measures. In terms of controlling health hazards, for example, they can derive in significant benefit and result in co-benefits as well; the total cost can be reduced when compared with a situation in which air pollution prevention measures and the measures to cope with global warming are taken individually.

[14] RAINS Europe (Regional Acidification Information and Simulation Models): Simulation model regarding the movement of transboundary air pollution (acid rain, etc.) in Europe. This model was

constructed by the International Institute for Applied Systems Analysis (IIASA) in 1984. It is utilized as a scientific tool to support negotiations between each country regarding the Oslo Protocol (1994) based on the Convention on Long-range Trans-boundary Air Pollution (1979), and had a significant influence on the outcome of reduction targets. It takes its estimates by entering the need for environmental improvement goals, the cost for pollutants reduction, emission of contaminants and their influences, etc.

- Explore these measures which are called co-benefit approach which are centered in Japan and promoted in other regions in Asia etc.
. Greenhouse effect gases which are not specified in the Kyoto Protocol as the targets for reduction
. Impacts of short-lived climate forcers (SLCFs) on global warming
. Co-control of air pollutants and greenhouse effect gases
. Co-benefits approach regarding air pollution and global warming

3. Key Words for the Basic Contents

(2) Air pollution problems and measures in Japan

Yokkaichi Pollution Lawsuit, Japanese experiences on serious air pollution problems, point source countermeasures, historical change in investment of industries on environmental pollution control, countermeasures on mobile emission sources, Japan's international contribution in air pollution control, newly emerging air pollution issues

(3) The progress toward the comprehensive atmospheric environmental control including transboundary air pollution issues

Europe's Convention on Long-Range Transboundary Air Pollution, Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol), Regional Acidification Information and Simulation Models (RAINS Europe), comprehensive and integrated atmospheric environmental management, Acid Deposition Monitoring Network in East Asia, etc.

(4) Air pollution and global warming problems

Short-lived climate forcers (SLCFs), co-control, co-benefits, co-benefits approach, black carbon, tropospheric ozone, methane

4. Additional Contents

(1) Japan's air pollution experience
(2) Atmospheric environment monitoring and the transition of air pollution
(3) Efforts for air pollution prevention measures by each individual country
(4) Transboundary air pollution problems
(5) Comprehensive and integrated atmospheric environmental management
(6) Dust and sand storm (DSS) problems
(7) Haze issues in southeastern Asia

(8) ABCs problems
(9) Links between air pollution and climate change issues

5. Additional Key Words

(1) Japan's air pollution experience
Japanese Report on Air Pollution Experiences, economic analysis

(2) Atmospheric environment monitoring and the transition of air pollution
Photochemical oxidant and tropospheric ozone, PM

(3) Efforts for air pollution prevention measures by each individual country
Report on air pollution control policies in each country (UNEP, Kanazawa University),

(4) Transboundary air pollution problems
Structure of the Europe's Convention on Long-Range Transboundary Air Pollution, Acid Deposition Monitoring Network in East Asia, Transboundary Air Pollution Control based on Malé Declaration in South Asia, etc.

(5) Comprehensive and integrated atmospheric environmental management
RAINS Europe、RAINS Asia

(6) Dust and sand storm (DSS) problems
Health effects by yellow sand/dust and sand storms (DSS), source areas of yellow sand and secondary hoist, international frameworks such as TEMM

(7) Haze issues in southeastern Asia
ASEAN Agreement on Transboundary Haze Pollution

(8) ABCs problems (Atmospheric Brown Clouds)
Report on ABCs by UNEP

(9) Links between air pollution and the climate change issues
Co-benefits approach

3) Water pollution, soil pollution and countermeasures

■ Objective

Explore water and soil that are significant key components of ecosystems which surround us in terms of roles in ecosystems, the relation to our lives, and their influence when they become contaminated. Comprehend the importance of water/soil environmental conservation, consider countermeasures and acquire the attitude to take action to the extent possible in our daily lives.

For the abovementioned purpose, first summarize the existent forms of water and soil, circulation mechanisms, links to other creatures and the resultant relationship to human life. Students will understand how we are dependent on water and soil through utility types of them (domestic use, agricultural water, industrial water, fishery, forest, paddy field, farm, etc.).
However, at present, these important water and soil are contaminated with toxic substances and threatening our lives in diverse areas. Discuss water pollution and soil contamination, presenting concrete examples (Minamata disease, Itai-itai disease, river and underground water contamination by organic substances, eutrophication of lakes and inland seas, soil contamination by heavy metals and solvents, etc.) including past pollution problems. Specifically, it is important to note the fact that these environmental pollutions are deeply related to economic growth we have achieved and that our lifestyle of the drive for prosperity are linked to pollution issues.
Subsequently, understand efforts toward water pollution and soil contamination prevention including regulations, antipollution measures, the present state and trends of treatment technology, and consider how these efforts are related to our daily lives. In the case of students, they understand the significance of protecting water and soil environments, focusing on their own interests such as theme of concerns regarding environmental load from domestic water usage (cookery, laundry, and bathroom), management of chemicals at universities, local rivers and agricultural land surveys etc, and encourage action toward environmental preservation.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: Comprehend the significance of water and soil (20 minutes)
(2) The actual state of water pollution and soil contamination and backgrounds (30 minutes)
(3) Efforts to mitigate water pollution and soil contamination (25 minutes)
(4) Conclusion: Review of life toward pollution prevention (15 minutes)

The Points of this Class

- The reason why we highly regard water and soil environmental conservation comes from the knowledge of how our life depends on water and soil.
- Learn from specific examples such as what kinds of substances cause water pollution and soil contamination, and how the aforementioned issues affect human health and ecosystems. Also, comprehend the causes of these environmental pollutions and social backgrounds.
- Interpret two types of antipollution measures, regulation and pollution prevention, and give a summary of environmental standard by water areas and effluent standard, soil environmental standard, Water Pollution Control Law, Agricultural Land Soil Pollution Prevention Law, Soil Contamination Measure Law Bill, etc. In addition, although there are a variety of pollution prevention measures, explain water supply treatment, sewage or replacement of contaminated soil etc. as typical examples to understand the structure.
- In order to reduce environmental loads, consider our possible actions in daily life while comprehending our utility needs from water and soil, and pollutant elimination methods with regard to soil contaminants.

2. Description of the Basic Contents

(1) Introduction: Comprehend the significance of water and soil (20 minutes)

Explain how we receive benefits from water and soil in the configuration of water circulation and land-use patterns (particularly agriculture land and forests) utilizing a panoramic illustration which shows how living spaces (urban area, agricultural district) surrounding us, water in nature, and soil are united. Through this discussion, understand that soil is Mother Earth, through exploring the links between water, soil, and creatures, percentage of usable fresh water for humans, microorganisms in the soil, and the existence of underground water.

(2) The actual state of water pollution and soil contamination and backgrounds (30 minutes)

In this part, a description of actual past contaminations through particular pictures and figures will have more impact on students. Utilizing examples such as mercury contamination in Minamata Bay, soil polluted by cadmium around Jintsuu River, deserted urban rivers where even a fish cannot live, former factory sites polluted by hexagonal chromium, trichloroethylene contamination in the groundwater, make reference to socioeconomic backgrounds which generated these pollutions while describing the causative agents, impact, causes, measures, etc. Then, explain that our lifestyle of the drive for prosperity and convenience have constantly contributed to some environmental loads through examples of domestic waste water, pesticide, and chemical fertilizer etc.

(3) Efforts to mitigate water pollution and soil contamination (25 minutes)

- Pollution prevention efforts are composed of regulations and pollution mitigation measures (pollution source control, treatment technology). Firstly, explanation is required, for example, for environmental standards at least according to water areas, water discharge standards for offices, soil environmental standards, and laws such as the Water Quality Pollution Control Act, Farmland Pollution Control Act, and Soil Contamination Countermeasures Act etc. regarding legal frameworks for pollution control.
- Although pollution source control in factories etc. (reduction of hazardous substances, reuse, water conservation) carry high priority among pollution prevention measures, during this section, depending on time constraints, describe the mechanism of contaminant removal technology such as water supply and sewage treatment, replacement of contaminated soil, etc.

(4) Conclusion: Review of life toward pollution prevention (15 minutes)

Consider our possible actions in daily life while comprehending our utility forms of water and soil and methods for eliminating contaminants in the water and soil environment in order to reduce the environmental load. Comprehend the important point, which is pollution source control, for avoiding unnecessary water use to the extent it is possible and utilizing rain water or recycled water as well as recognizing the significance of reducing the load on water and soil by restricting the use of hazardous substances.

Specifically, university students should understand the significance to protect water and soil

environments through themes of their interests such as environmental load from domestic water usage (cookery, laundry, and bathroom), control of chemicals at universities, local rivers and agricultural land survey (water quality examination, cleaning activities), etc. and encourage acts supporting environmental preservation.

3. Key Words for the Basic Contents

(1) Introduction: Comprehend the significance of water and soil

Configuration of water circulation, percentage of usable fresh water for humans, microbes in the soil

(2) The actual state of water pollution and soil contamination and backgrounds

Mercury pollution in Minamata Bay, soil polluted by cadmium around Jintsuu River, former factory sites polluted by chromium hexavalent, groundwater polluted by trichloroethylene, domestic waste water, agricultural chemicals, chemical fertilizer

(3) Efforts to mitigate water pollution and soil contamination

Environmental standard of water, discharged water standard, soil environmental standard, Water Quality Pollution Control Act, Farmland Pollution Control Act, Soil Contamination Countermeasures Act, water supply, sewerage, replacement of polluted soil

(4) Conclusion: Review of life toward pollution prevention

Pollution source control, chemicals management, water quality examination, cleaning activity

4. Additional Contents

According to the characteristics of university and regional peculiarities, naturally changes in lesson curriculums or additional topics are possible since students' subjects of interests are different. The topics considered are as follows:

(1) Water resources and usage
(2) Marine pollution and groundwater pollution
(3) The relationship between the human body and water
(4) Components of the soil
(5) Water and soil environments near the university location
(6) Subsidence problems
(7) International movements regarding water and soil environments

4) Waste management and recycling

■ Objective

Understand today's waste problem as deeply related to a social system of mass production and consumption and our lifestyle that strives for convenience and comfort. Also, comprehend that solving waste problems contribute to the resolution of the earth's environmental issues as waste

problems are directly connected to earth's resource and energy depletion, and consider how each business, administration and citizen should address waste issues. Then, encourage students to become interested in waste problems as a student (citizen, consumer) in daily life and to acquire the attitude to address the issues and take action toward solutions.

For these purposes, describe the causes regarding quantitative and qualitative changes in waste in the classification of domestic waste and industrial waste as well as introducing how waste problems have historically become social issues. Then, teachers introduce what kind of problems were generated while students understand regarding waste countermeasures thus far with changes in legislation, local governments' treatment systems for domestic waste, and businesses' efforts to deal with industrial waste.

Particularly, regarding waste countermeasures increased rapidly during a high economic growth period, reflecting public health measures toward proper handling such as incineration and landfill disposal which took precedence over the efforts to reduce waste and promote recycling etc. that caused the delayed actions, interpret 3R (reduce, reuse, recycle) measures required nowadays including dioxin issues, shortage of the final disposal site, resources and energy problems, etc.

Then, in order to solve waste problems fundamentally, understand that producers should take efforts starting at the design stage so consumers are required to consider methods of consumption, and administrations need to establish 3R measures as the social system.

With regard to the attitude necessary to address waste issues, understand not only prescribed waste separation rules but also the fact that the source of wastes are resources, consider how to reduce waste itself, and acquire the attitude toward practicing these.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: Learn about what is in the trash that people throw away (10 minutes)
(2) Waste treatment system thus far and problems to be solved (35 minutes)
(3) Efforts to address waste problems hereafter (30 minutes)
(4) Conclusion: Review the social system and lifestyles (15 minutes)

The Points of this Class

First, start with learning about the realities of the waste we create. Specifically for students, encourage them to find out what percentage of familiar household garbage is comprised of disposable products and the background of this phenomenon reflecting the lifestyle which seeks comfort and convenience, and expand this view to consider the economic activities of producers and vendors to promote such a lifestyle. Then, recognize anew that the products which become waste are actually made using the earth's precious resources and energy, thus regard waste problems as resource and energy issues.

Explain correspondences to waste issues in Japan that started from the viewpoint of public health and have gradually changed into a focus on 3R measures, and, by using specific examples, help students understand current waste treatment systems for domestic or industrial waste control systems.

Then, partnerships among businesses (production, distribution), administrations and citizens (resident, consumer) are critical. In particular, emphasize that efforts in the production stage are more important. Further, consider the attitude students should have to address waste problems from citizen and consumer points of view.

2. Description of the Basic Contents

(1) Introduction: Learn about what is in the trash that people throw away (10 minutes)

First, in order to make an impact on students, present pictures or graphs regarding the contents of domestic waste, and encourage students to consider how much trash they generate is comprised of disposable things (plastic packaging, etc.) and what is wasted when it is disposed of (leftover food, etc.). In addition, comprehend that this is a reflection of our lifestyles or social and economic systems.

Also, mention that wastes are composed of manufactured goods and products, a fact that is deeply connected to the earth's environmental problems.

(2) Waste treatment system thus far and problems to be solved (35 minutes)

In this part, describe the historical changes and social backgrounds of Japanese waste problems through incidents that led to social issues (Tokyo garbage conflict, industrial waste issue of Toshima), and encourage students to understand how waste issues emerged as economic growth expanded and the negative legacy of rich life became evident. Then, so as to correspond to waste issues, introduce current disposition systems in as concrete terms as possible including the municipal treatment of domestic waste, efforts by businesses for managing industrial waste, control systems to manage specially-controlled waste while explaining measures implemented in Japan through the transitions of legislation. Further, illustrate the problems revealed in these processes (dioxin issue, crunch of disposal site, responsibility of business operators, and resources and energy issues, etc.) as well as the details of gradual change to require 3R efforts.

(3) Efforts to address waste problems hereafter (30 minutes)

Nowadays, the legal framework regarding waste has been drastically changed. Introduce diverse recycling laws enacted under Fundamental Plan for Establishing a Sound Material-Cycle, and simultaneously, discuss how many municipalities adopted a charge for garbage, etc., and the movement to reduce waste is gaining momentum etc. Whereupon, in order to interest students, explain how they should be involved in the systems of daily life pertaining to more familiar matters and from what kind of background these systems, such as Act on the Promotion of Sorted Garbage Collection and Recycling of Containers and Packaging, Act for Recycling of

Specified Kinds of Home Appliances, and charge for garbage were adopted. Specifically, it is necessary to note the extended producer responsibility viewpoint as a background international trend, and the fact that it is not until consumers understand and cooperate in these systems that they are realized.
Further, comprehend the necessity of product assessment on the producer side and the significance of green consumer campaigns on the consumer side.

(4) Conclusion: Review social system and lifestyles (15 minutes)
Although 3R efforts have gradually become regarded as important to waste problems, these efforts require partnerships among business operators (producer), citizens (consumer), and administrations (coordinator). Then, it is important to gain students' understanding that waste solutions serve to reduce the total amount of waste within the whole society, which leads to energy preservation toward a sustainable society.

Ultimately, though the promotion of 3R is critical for waste problems solutions, consider the priorities of the 3R efforts consist of preventing waste generation, reusability, and recycling, and reasons why they are ranked as such. Moreover, encourage students to list examples of concrete 3R efforts and to practice what they can.

3. Key Words for the Basic Contents
(1) Introduction: Learn about what is in the trash that people throw away
Contents of domestic waste, plastic packaging, left-over food, lifestyle, socio-economic system

(2) Waste treatment system thus far and problems to be solved
Tokyo garbage conflict, industrial waste issue of Toshima, domestic waste, industrial waste, specially-controlled waste, dioxin issue, crunch of disposal site, producer responsibility, resource and energy issues, 3R (Reduce, Reuse, Recycle)

(3) Efforts to address waste problems hereafter
Basic Act for Promotion of the Recycling-Oriented Society, charge for garbage, Act on the Promotion of Sorted Garbage Collection and Recycling of Containers and Packaging, Act for Recycling of Specified Kinds of Home Appliances, extended producer responsibility, product assessment, green consumer campaign

(4) Conclusion: Review the social system and lifestyles
Coordinator, partnership, sustainable society, preventing waste generation, reuse, recycling

4. Additional Contents

University waste treatment systems and recycling systems differ according to the regions where the universities were established, and each university's waste control systems are also different,

therefore students should gain a thorough understanding of rules regarding waste efforts in daily life.

(1) Waste control systems in the region to which the university belongs
(2) Universities' waste treatment systems
(3) Prevention of illegal dumping when they relocate the sites
(4) The structure of waste incineration plants or final disposal sites
(5) Current state of recycling in Japan
(6) International movement regarding waste and recycling

5) Chemical pollutant and countermeasures

■ Objective

Our convenient and comfortable lives in this modern time are supported by many chemicals. While chemicals contribute to the improvement of the lives of the citizenry, they sometimes pose risks in terms of environment and safety. Here, explore examples such as environmental pollution due to chemical contamination, impact on ecosystems, industrial accidents, health disorders, etc., consider a desirable method of chemical control within the social system, and acquire the attitude to practice environmental and safety measures regarding familiar chemicals in our daily lives.

For the abovementioned purposes, first, learn the types of chemical substances, and a summary of how much are currently used in the world, and learn the hazards and risks referring to examples of pollutions or accidents specifically involving chemicals that could become problems for environment and safety concerns. Then, introduce major legislative efforts regarding these chemicals in Japan. Whereupon, describe the definition of chemicals or the assessment method of toxicity through the typical law, Law concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. Further, explore significant concepts in environmental and safety measures and risk management perspectives. Also, deepen the understanding of the importance of examination in advance and the precautionary principle.

If the target students are majoring in science, dealing with chemicals in experiments is an important concern, and if they major in humanities, interest them by discussing topics of food additives or household chemicals (pesticide, bleach, etc.), and nurture the attitude to protect environment and promote safety.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: Learn the relation between our lives and chemicals (15 minutes)
(2) Examples of environmental pollution or disasters due to chemicals (30 minutes)
(3) Efforts toward chemical control (30 minutes)
(4) Conclusion: Toward the proper management of chemicals (15 minutes)

The Points of this Class

There are both positive and negative aspects of many things we deal with in the world. Chemicals are typically the example, as on one hand, they carry the benefit of making our lives convenient and comfortable, but on the other hand, they present risks in terms of environment and safety. Learn how to think about balancing the benefits and risks (risk management), understand specific legal management systems currently enacted regarding chemicals, and cultivate one's own ideas and attitudes toward familiar chemicals.

Whereupon, describe chemicals that have been problems in terms of the environment or safety concerns, for instance, PCB, dioxin, chlorofluorocarbon, endocrine disruptor, mutagen[15], asbestos, etc. and deepen the students' interest. Simultaneously, present topics regarding the risks of familiar chemicals such as plastics, food additives, cleansers, spray cans, etc., and encourage students to consider these convenient chemicals in their lives and their own control methods, and then to practice them.

2. Description of the Basic Contents

(1) Introduction: Learn the relation between our lives and chemicals (15 minutes)

First, understand how many chemicals surround us, introducing that globally, there exist over several hundred thousand types of chemicals at present and even among those used widely in the market, there are tens of thousands of types utilizing numerical values in Chemical Abstract etc. Also, after explaining that the terminology in chemical definitions differs according to the fields in which these definitions are used, relate that we deal with the definition of chemicals as "artificially synthesized substances that are problems in terms of the environment or safety concerns." Likewise, explain the benefits (convenience of life, comfort, etc.) and risks (environmental issues, safety problems, etc.) involved with the dependence on these chemicals, using examples such as chlorofluorocarbon or battery concerns etc.

(2) Examples of environmental pollution or disaster due to chemicals (30 minutes)

In as concrete terms as possible, organize and introduce concerns regarding chemicals that have been problems thus far, mainly the impacts (health effects on humans, impact on ecosystems, disaster in terms of safety, etc.), backgrounds in which they have been used, etc. Particularly, present substances such as PCBs, dioxins, chlorofluorocarbon, endocrine disruptors, mutagens (carcinogens), asbestos, heavy metals (mercury, lead, cadmium, etc.), hazardous materials in Fire Service Act. It should be noted how these substances affect the environment, for example, as concentration issues within food chain, concerns regarding degradability in nature, etc. In recent years, there is a rising concern about chemicals' impact on ecosystems as well as their effects on human health.

(3) Efforts toward chemical control (30 minutes)

Currently, there are diverse legal management systems for the abovementioned chemicals. In concrete terms, there are the following laws and ordinances: Law concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., Law concerning Special

Measures for Promotion of Proper Treatment of PCB Waste, Law concerning Special Measures against Dioxins, Law concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures, Poisonous and Deleterious Substances Control Law, Industrial Safety and Health Law (including the Ordinance on Prevention of Hazards due to Specified Chemical Substances), Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (Pollutant Release and Transfer Register: PRTR), and Fire Service Act (including handling hazardous materials, etc. Explain these, using more details, including assessment measures regarding Law concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., which takes a major role in Japanese efforts for regulating chemicals. Further, strive to deepen the understanding of "risk," which is a fact of life in chemical management, particularly regarding viewpoint, assessment, management, etc. Specifically, the significance of preliminary reviews and precautionary principles should be emphasized. If time allows, describe the world movement to manage chemicals (Stockholm Convention on Persistent Organic Pollutants: POPs, EU legislative decree, etc.).

[15] Mutagen: The substances that show abilities of radiation (physical factor) or chemicals (chemical factor) to act upon DNA or chromosomes in charge of genetic trait information and induce changes in traits (DNA genetic mutation) or chromosomal abnormalities (numeric and morphological changes in chromosomes), or mutagenicity.

(4) Conclusion: Toward the proper management of chemicals (15 minutes)
Consider what students should keep in mind regarding familiar chemicals after understanding that they provide benefits for our lives, yet, on the other hand carry accompanying risks. When handling chemicals at science universities, encourage students to keep rules such as safety measures for experiments, practice separation of laboratory wastes, and strive toward the preservation of their working environment as well as drawing students' attention with consultation of the guide of handling chemical substances which was prescribed by school considering impact on environmental pollutions, affects on health, and disasters and accidents etc. At universities with humanity majors, present plastics, food additives, cleansers, and spray cans, etc. and through discussion, encourage students to nurture the attitude to consider how to view chemicals, address their issues, and take actions through discussion with regard to problems in the fields of environment, health, and safety.

3. Key Words for the Basic Contents

(1) Introduction: Learn the relation between our lives and chemicals
Chemical Abstract, benefit, risk, chlorofluorocarbon, battery

(2) Examples of environmental pollution or disasters due to chemicals
Polychlorinated biphenyl (PCB), dioxin, endocrine disruptor, mutagen (carcinogens), asbestos, heavy metal (mercury, lead, cadmium), hazardous material on Fire Service Act, food chain

(3) Efforts toward chemical control
Law concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., Law concerning Special Measures for Promotion of Proper Treatment of PCB Waste, Law concerning Special Measures against Dioxins, Law concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures, Poisonous and Deleterious Substances Control Law, Industrial Safety and Health Law (including the Ordinance on Prevention of Hazards due to Specified Chemical Substances), Law concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR),
Fire Service Act (including handling hazardous materials), preliminary review, precautionary principle, Stockholm convention on Persistent Organic Pollutants (POPs),
EU legislative decree

(4) Conclusion: Toward the proper management of chemicals
Chemicals, guide to handling chemical substances, separation of laboratory waste, preservation of the working environment, plastic, food additive, cleanser, spray can

4. Additional Contents
When slightly less familiar chemical substance names are used, the students' backgrounds should be considered. Further, according to the characteristics of universities, the following topics are considered to be fitting in some cases.

(1) "Silent Spring" by Rachel Carson
(2) Sick House Syndrome, Sick School Syndrome
(3) Agrichemicals and chemicals
(4) Medical supplies and chemicals
(5) Geoengineering

6) Loss of biodiversity and countermeasures

■ Objective
Although diverse creatures co-exist on this earth after a biological evolution which is said to have taken for 4 billion years, due to the destruction of habitats by humans, hunting and gathering, introducing alien species, water and soil pollution, and climate change, nearly 40,000 biological species have disappeared each year. Particularly, loss of tropical forests, desertification of meadows and grasslands, and a decrease of wetlands, reduction of sea ice areas, destruction of seaweed beds, and depletion of coral reefs, etc. are major causes of loss of biodiversity as these issues deprive wild animals of their habitats.

First, in this class, explore and discuss the following points:

- How many species exist on the earth at present as the result of 4 billion years of biological evolution, and how rapidly the extinctions of species continue. This rate of the extinction of species is rapidly getting higher after the 20th century.
- In the background of biodiversity loss, there are issues such as loss of creature habitats due to development, the decline of symbiotic relationships between humans and nature in Satochi and Satoyama etc., ecological disturbances due to importing exotic species along with expanded trade zones, influence of global warming, etc.
- The background of loss of forests, meadows, and grasslands is that the symbiotic relationship between humans and nature lost balance in economic progress as seen in burnt field practices and nomadic grazing etc., over-harvesting, over-cultivation, and over-grazing are being conducted. The decrease of wetlands, sea ice areas, seaweed beds, and coral reefs are caused by development activities, ocean acidification, elevated water temperature, etc., which results in the decline of fishery resources and brings a possibility to menace tens of millions of people's lives.
- Consequently, the aforementioned issues cause a loss of biodiversity formed through a delicate balance of diverse species, as well as the disappearance of genetic resources useful for plant breeding of crop cultivation and the decline of traditional societies and cultures which were established based on rich ecosystems.
- Understand the following effective methods in order to prevent loss of forests, meadows, grasslands, and wetlands and conserve biodiversity: Legislation for the prohibition of commercial transactions of endangered species and the exploitation of scarce biological resources, the formulation of land use planning for nature reserves or development reserved districts etc., self-defensive endogenous developments versus development by foreign capitals by local residents, attempts to breed rare species such as biotopes or artificial rearing, enlightened awareness of consumer behavior with consideration for the conservation of biodiversity such as fair trade practices.

Deepen the understanding of the following matters: Loss of biodiversity is an irreversible change and the species will never revive once it becomes extinct; it is most important to protect forests, meadows, Satoyama, Satoumi, and wetlands, coral reefs, etc. from development and development with consideration to symbiosis with other organisms is critical for the aforementioned purpose; efforts are taken through the Convention on Biological Diversity, National Strategy of Biological Diversity, etc. Learn skills to utilize databases related to biodiversity through the Internet or ecosystems assessments methods etc. Realizing the richness of co-existing with other creatures through encounters with various species outdoors, acquire attitudes towards life as founder of a society in harmony with nature.

■ Outline of the Educational Contents

1. Basic Contents

(1) Introduction: Loss of biodiversity and decrease of forests, meadows, and wetlands (10 minutes)

(2) The backgrounds of loss of biodiversity (20 minutes)
(3) Loss of forests, meadows, and wetlands (30 minutes)
(4) Efforts for conservation of biodiversity (30 minutes)

The Points of this Class

Nearly 40,000 species become extinct from this earth every year, and in the background, many creature habitats such as forests, meadows, wetlands and coral reefs etc. decrease. Although there is a point of view that habitat decreases are inevitable due to population growth and economic development, forests, meadows, wetlands, and coral reefs are providing multi-faceted ecosystem services, and development of management techniques to enrich ecosystems and institutional designs for conservation of biodiversity are proceeded. Thus the creation of a society in harmony with nature is oriented.

2. Description of the Basic Contents

(1) Introduction: Loss of biodiversity and decrease of forests, meadows, and wetlands (10 minutes)

- Although it is said that about 1.3 million of a variety of creatures live on this earth through 4 billion years of biological evolution, 10-30% of known mammals, birds, and amphibians are threatened with extinction, and as a backdrop to this crisis, there is the issue of a constant decrease in many creature habitats such as forests, meadows, and wetlands due to development. It is known that this phenomenon causes a decrease in stability and recovery property of ecosystems in many cases, and has a diverse influence on the food chain or the supply of ecosystems services, resulting in sundry impacts on humans who are members of the same ecosystems.
- Biodiversity is composed of 3 aspects, “diversity of species,” “genetic genes,” and “diversity of ecosystems,” and humans receive various kinds of services from these ecosystems.

(2) The backgrounds of loss of biodiversity (20 minutes)

- In the background of biodiversity loss, there are issues such as the reduction of creature habitats due to development, a decline in population by means of overfishing/hunting, a decline in symbiotic balance because of a lack of human management in secondary nature such as “Satoyama,” and ecological disturbances due to importing exotic species along with expanded trade zones, etc.

(3) Loss of forests, meadows, and wetlands (30 minutes)

- The symbiotic relationship has been established between humans and nature through a long history together thus far, as seen in burnt field practices and nomadic grazing in forests and meadows.
- However, with the development of a market economy, over-harvesting, over-cultivation, and over-grazing have been conducted. Moreover, climatic and symbiotic relationships are rapidly destroyed because of exploitations by foreign capitals that lack relationships with the

local area.

- Although wetlands, seaweed-beds, and coral reefs, etc. are vital locations as habitats etc. for diverse animals and plants, their decrease and degradation are proceeding rapidly due to development activities or ocean acidification. There are possibilities to bring not only loss of biodiversity but also a decrease in fishery resources etc. and threaten hundreds of millions of people's lives.

(4) Efforts for conservation of biodiversity (30 minutes)

- While loss of biodiversity is proceeding, attempts to restore biodiversity such as legislations for prohibition regarding commercial transactions of endangered species and the exploitations of scarce biological resources, formulation of land use planning for nature reserves or development reserved districts etc., green conservation utilizing biotope or climax dynamics techniques, artificial rearing of rare species, etc. are conducted.
- Institutional designs for the conservation of biodiversity such as the Convention on Biological Diversity and National Strategy of Biodiversity are proceeded.

3. Key Words for the Basic Contents

(2) The backgrounds of loss of biodiversity

Biodiversity, extinction rate, hot spot, stability and recovery property of ecosystems, food chain, development and conservation, diversity of species, genes and ecosystems

(3) Loss of forests, meadows, and wetlands

Rainforest, desertification, burnt field, nomadic grazing, Satochi and Satoyama, commercial logging operation, over cultivation, over-grazing, exogenous development, endogenous development, climatology, wetland, sea ice area, seaweed bed, coral reef

(4) Efforts for conservation of biodiversity

The Convention on Biological Diversity, National Strategy of Biodiversity, Tenth meeting of the Conference of the Parties to the CBD (COP10), Washington Convention, the Ramsar Convention, biotope, climax dynamics, artificial breeding, zoning, ecosystem service, natural capital

4. Additional Contents

(1) Present examples of extinct species in Japan or examples like the artificial breeding of the ibis, and encourage students to learn that biodiversity loss is particularly an irreversible problem among the earth's environmental issues.

(2) Through examples such as mangrove reduction along with expansion of shrimp farming in Southeast Asia, learn that the rate of forest loss etc. is accelerated due to developments by foreign capital which lacks in relationships with local residents.

(3) Show examples such as the increase of forest areas in developed countries or as in the case of China where forests and grasslands areas are increasing, and let students learn that ecological regeneration is possible through efforts using long-term vision.

(4) Learn the vision of a society in harmony with nature and its forming conditions.

5. Additional Key Words

(1) Examples of loss of biodiversity

Red data book, artificial breeding of the ibis, evolutionary ecology

(2) Global economy and loss of forests

Plantation, tropical forest reduction, mangrove reduction, The Tragedy of Commons

(3) Ecological regeneration

Ecosystem network, agro-forestry, reproduction of Satochi and Satoyama, sustainable land use

(4) Creation of a society in harmony with nature

Society in harmony with nature, national ecological network, garden city, new commons, regional cycle symbiotic community, landscape ecology

Chapter 4 The Effective Education Methods to Acquire Skill and Attitude etc.

1. Types and Outlines of Education Methods to Acquire Skills and Attitudes etc.

In environmental education, it is significant to acquire not only knowledge but also skill (ability) to comprehend the relevance between one's own behavior and environmental issues, and acquire the attitude (readiness) of sense of responsibility and values etc. to encourage themselves to realize problems and take actions. For this purpose, education methods should be devised.
In this Guideline, the section titled "Acquire knowledge, skills, and attitudes" in chapter 1 and the section "Subject structures to acquire skills and attitudes" in chapter 2 are set to recommend specifically hands-on learning and workshop style lessons etc. outside the classroom lecture style.

Teaching methods outside the classroom lecture style are generally classified as follows:

(1) Invite practitioners rather than teachers
Invite people responsible at administrations, corporations, and NGO/NPOs, etc. and let them talk about corporate environmental efforts based on their own experiences and problems in taking efforts. It is considered to be effective as students can indirectly experience "the dignity of the fact" based on a real experience with them.

(2) Utilizing video contents etc.
Although the proverb "Seeing is believing" has been used since ancient times, it is difficult to describe the mechanisms of environmental issues in a comprehensible way with only charts or words from teachers, not to mention experience the actual state of environmental issues. There are diverse types of video content such as ones with a summary of realities of and damages from environmental issues, and the ones that explain the mechanisms of environmental issues, etc. It is effective to utilize these materials.

(3) Let Students explore
To encourage students to explore and organize ideas regarding the efforts by administrations, corporations, NGO/NPOs, and international efforts etc., lead them to summarize their own opinions according to the findings; students can do this on their own initiative as well.

(4) Let students experience (hands-on learning)
There are diverse kinds of facilities that provide hands-on learning such as museums, administrations (waste disposal and treatment facilities, sewage treatment plants, water purification plants, etc.), private facilities that accept public visits (factories, corporate museums, recycling facilities, etc.), natural parks, maneuvering grounds, etc. In addition, there are many kinds of facilities that offer nature and farming experiences or organizations that host this type of hands-on learning etc. It is

considered to lead students think for themselves and take actions through their own experiences, which they cannot gain through classroom style lectures.

(5) Conducting examination, discussion, and presentation by students (workshop-style lesson)
Suggest some themes and encourage students to conduct a preliminary survey or to examine during class, or let them consider and discuss given themes in groups. Then, help students to summarize and share the results of discussions in the class, and further, conduct discussions with the whole class. Through group discussions, students can think for themselves about the interrelationships and complexities of environmental issues.
These types of teaching methods encourage students to have “awareness” through their own analyses and findings and will result in a nurturing “attitude” toward environment issues. Also, an effective approach is sharing students’ knowledge, experiences and viewpoints, and this can lead to a consensus in accepting each other’s ways of thinking and senses of values.
Further, problems regarding environmental issues or sustainability have extremely complicated structures while these interrelate in a variety of ways including social and economic elements. Learning environmental issues means nothing but developing diverse and bird's eye “viewpoints/ways of thinking.” In order to cultivate “viewpoints/ways of thinking,” it is said that the following 12 elements are effective: acquiring the overview, considering through comparisons, grasping from a two-dimensional axis, classifying, understanding causal relationship, considering priorities, comprehending quantitatively, considering temporally, understanding spatially, grasp by the indexes, thinking from model simulations, and design plans.
In this Guideline, illustrate how to utilize the methods as references when dealing with environmental themes as participatory approach examples for workshop style lessons. In the next chapter, examples of this approach, “association in figure,” “correlation table,” “matrix table,” “causality table,” and “ranking” as well as introducing the outlines will be practiced.[16]

In addition, introduce illustrations to learn the ideal efforts for environmental solutions by discussing products or corporate activities (examples actually implemented by corporations), cases of field work utilizing resources in the regions where universities are located, and as actual examples of hands-on learning, introduce “brain storming,” “catechetical method/conversation,” and “KJ method”.

Consulting these examples, devise the course contents and methods according to each university’s educational policies and characteristics, the current situations of the regions where universities are located, faculties and departments which implement the courses, and the number of students who take the course.

[16] In the preparation of this chapter, “Utilizing 8 hands-on style <basic tools> TOOL8” and “12 viewpoints/ways of thinking to teach in participatory methods” was consulted and quoted.

2. Outline of Teaching Method through Workshop Style Lesson

1) Association figures

The goals and outline of this method	Association figures are a method used to grasp (comprehend) the overview of matters. Regarding the given theme, this method makes it possible to grasp the overview through learning the links among problems or expanse of them etc. regarding the theme (topic). In environmental education, this can be used to understand interrelations and complexities of environmental issues, for instance. Likewise, brain storming etc. is also a method to grasp the overview.
The number of students	No limit (Both of individuals and groups are possible.)
Location	Indoors
Requirements	Paper, marker pens (when it is conducted in groups)
Procedures	(1) Write down the theme or topic in the center, and related matters (In case it is conducted in groups, discussions will not be done. Individuals will share whatever came up in his/her mind freely. Write down on the paper and draw lines to connect related matters.) (2) Share what they realized and notice in the completed association figures. (3) Have presentations by groups and share with the whole class.
Points to remember	Recognize the diversity of the theme and topic by grasping them from different points of view.

■ Examples of utilization

Theme: "Resources and global capacity"

Objectives: Deepen understanding about the ideal use of oil and how energy or measures should be managed hereafter through considering the significance of oil use which comprises a major energy source for modern mankind and what "oil depletion" means etc.

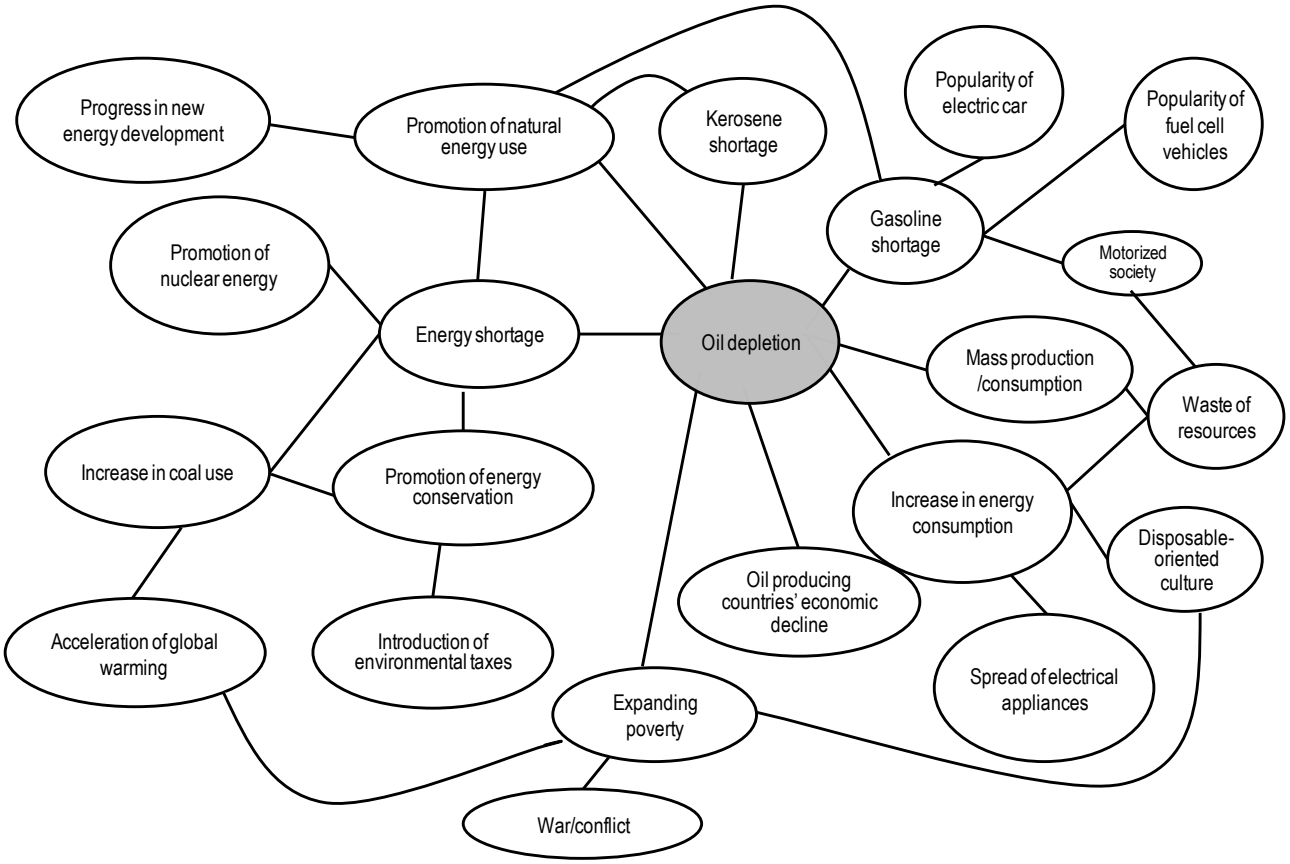
Time: 40 minutes

Concrete procedures (when conducted in groups):
(1) Write down "oil depletion" in the middle of the paper, and individuals write down related matters first, and connect them with lines. Further, write down more and more words they associate with the word in the center or added words, with connecting lines. (Each will use writing materials to write down more and more words that come to mind, using connecting lines. No discussion. Write down words that come to mind from other students' words and add connecting lines. The work time is estimated to be approximately 10 minutes.)
(2) Looking at the completed association figures, share what students recognized or noticed in their groups. Teachers direct the discussions as necessary, such as the causes of oil depletion, how

measures should be taken, etc. (The discussion time is estimated to be approximately 15 minutes.)
(3) Each group gives a presentation and shares with the whole class.

Points to remember: Encourage students to consider the following matters: Why oil supply has a possibility of depletion, what the causes are, and what we should do. In addition, distribute reference materials regarding deposits and uses of oil.

【Reference】



2) Comparison tables

The objectives and outline of this method	This is a useful educational method to ensure the recognition of oneself or the group regarding themes (topics) or for understanding interrelations of compared matters through considering questions such as "what I know/I would like to know," "plus/minus," or "old XX/present XX" etc. regarding a theme (topic). In addition, considering matters through comparison is useful for clarification of concepts.
The number of students	No limit (Both individuals and groups are possible)
Location	Indoors
Requirements	Paper, marker pens
Procedures	(1) Present to students what should be compared regarding the theme (topic). (e.g. "what I can do regarding environmental issues," "what I cannot do regarding environmental issues") (2) Write down more and more of what comes to students' minds in the group, and compare. (Writing down only the elements that were agreed in the group discussion may be acceptable, but in the case when it is

	hard to get a consensus, it might clarify the examination items if a table titled “points that cannot be agreed” was added.) (3) Discuss in groups about what was recognized or noticed regarding the matters compared. (Also discuss why it is possible, why it is impossible, or how it could be possible.) (4) Have presentations by groups and share with the whole class.
Points to remember	Consider how to deepen the understanding of the theme (topic) as well as gain a new “awareness” through focusing on not only the differences in opinions but also different values that lie at the root of the viewpoint.

■ **Examples of utilization method**

Theme: “What I can do and what I cannot do regarding environmental issues”

Objectives: There are many efforts that individuals cannot make. Through considering what kind of elements (social and economic factors) are essential to the efforts, learn interrelations and complexities of environmental issues. Also, understand that social correspondences do not work without individual positive efforts.

Time: 30 minutes

Requirements: Paper, marker pens

Concrete procedures:

(1) Consider “What I can do regarding environmental issues” and “what I cannot do regarding environmental issues” individually, and write down ideas on the personal comparison chart first. Whereupon, circle what one is already doing. Also, write down the frequency (every day, every time, once a week, once a month, etc.) in parentheses regarding what one is doing, what is possible hereafter, and what cannot be possible hereafter. In addition, write down what are considered to be problems regarding the action one is taking or can possibly take, if any. (The estimated time is approximately 10 minutes.)

(2) Based on the comparison tables students made, discuss in groups and make comparison tables regarding “what we can do about environmental issues” and “what we cannot do about environmental issues” as in the individual case. (The estimated work time is approximately 10 minutes.)

(3) Regarding “what we cannot do,” choose one or two items from the charts, and consider what kind of elements (social and economic factors) makes efforts possible, and discuss what we should do to realize it. (The estimated work time is approximately 10 minutes.)

(4) Share the discussed contents.

Points to remember: It is important to consider what we should do to motivate corporations and administrations etc., not just say “corporations and administrations are bad. That is why we cannot progress.”

【Reference】

What we can do regarding environmental issues	What we cannot do regarding environmental issues
● Turn off unnecessary lights. (everyday) Set the air conditioning temperature appropriately. (everyday) → Then, we cannot know how much CO2 is reduced. → The effects of efforts are not clear. No unnecessary shopping. ● Reduce the amount of trash. (everyday) Purchase products with low environmental loads.	Go to school by bicycles. (There is no parking at the station.) Recycle paper resources. (XX city does not collect them.) Reduce the amount of trash. (Packages or wrappings come along with shopping.) Not to purchase unnecessary things. (There is no selling loose.) Purchase products from corporations that are enthusiastic about solutions to environmental issues. (There is no information. We do not know how to evaluate.)

■ Discussions through comparisons (debates method)

Theme: "Efforts for global warming prevention in Japan and China"

Objectives: From the viewpoint of Japan and China where the greenhouse effect gases emissions are the highest in the world, discuss what kind of correspondences we should take regarding the reductions of green house effect gases, and understand that consensus-building is difficult with only discussions from a one-sided viewpoint, and diverse elements are to be considered.

Time: 40 minutes

Requirements: Nothing special

Concrete procedures:

(1) Make groups of 4-5 students, and divide these groups into two groups, A: Japanese government and B: Chinese government.

(2) Distribute to each group papers regarding economic data such as carbon dioxide emissions by each country in the world, the data on amount of emissions per capita, and GNP, etc.

(3) Divide groups of A and B into α: global warming prevention priority, and β: economic growth priority, and let them discuss regarding the reasons why adopting the policy and the merits of doing so, etc. and the counterarguments against reasons or merits another group will consider, then summarize. (The estimated discussion time is approximately 20 minutes.)

(4) Share the discussion results of each group. Whereupon, other groups proactively raise counterarguments, criticisms, and questions regarding the contents of the group's presentation.

(5) Summarize the report about what each student felt and understood regarding the whole contents of the presentations and discussion results.

Points to remember: Discussions based on not only the data of one year but also on past data (total amount of carbon dioxide emissions thus far) may be suitable. Also, it may also be fitting to state opinions from the standpoints of countries that are in crisis due to sea surface elevation incurred by global warming.

3) Matrix table

The objectives and outline of this method	This is the method for individual student to analyze “emphasizing” to show priorities quantitatively for each item through analyzing the merits or limitations of multiple selections (measures), and necessities utilizing the two-dimensional table. This method is effective when conducting comparison evaluations making tables with diverse measures.
The number of students	No limit (Both individuals and groups are possible)
Location	Indoors
Requirements	Paper, marker pens, circle seals
Procedures	(1) List multiple items to compare and examine (measure method and efforts items etc.) in the top vertical lined tables. (2) List viewpoints of analysis (targets for the comparison) in the leftmost vertical column from the top. (3) Remark the first one of the viewpoints from analysis (targets for the comparison) and evaluate all of the items in the horizontal row regarding the viewpoint (target). For example, one holds 5 circle seals, and put them according to his/her own evaluation (what are thought to be important) in each item from focused analytical viewpoint (target). (Depending on personal evaluation, there might be the case when 5 seals are concentrated on one item, or they are put in multiple items.) (4) Everyone puts up evaluation seals regarding all of the viewpoints and count the number of seals, and use numbers by each table. (5) Share the reasons why the evaluation was as such etc., and discuss characteristics of each item etc. Chart 1 Examples of Matrix Tables
Points to remember	Clarify why they were evaluated as such and what was weighed on individually.

	I T E M S				
The Analysis Point Of View	●	●●●		●●	●●●●
	●●●●	●●	●●●		●
	●		●●●	●●●●	●●
	●●●	●●	●●●●	●	
	●	●	●	●●	●●●●●

■ **Examples of utilizations**

Theme: “The ideal way governmental policy in each country should be”

Objectives: Understand the viewpoint of each country and the difference in their situations through considering what kind of policy should be conducted considering priorities from the standpoint of each country’s government.

Time: 40 minutes

Requirements: Paper, marker pens, circle seals

Concrete procedures:
(1) Write down policies the government should conduct in the horizontal line of the matrix table, and the names of multiple countries including Japan, America, and China in the vertical line. (The estimated work time is approximately 2 minutes.)
(2) Individually, hold 5 circle seals per country, and put seals in the table of policies considered to be important. (The estimated work time is approximately 10 minutes.)
(3) Share which points were considered and mark with circle seals, and discuss what was noticed or discovered from other students' evaluation results. (The estimated discussion time is approximately 15 minutes.)
(4) Share by group in the whole class.

Points to remember:
●Conducting the evaluation utilizing the materials of population by country, economic data, data related to environment is possible.

【Reference】

	CO2 reduction	Resources consumption reduction	Nature preservation	Pollutions prevention	Economic growth	Social welfare Completeness
Japan	●● ●	●	●		●	●
America	●● ●	●●	●		●●	
China	●	●●	●	●● ●	●● ●	
India						
Korea						
Philippines						

	Overcome poverty	Population control	Countermeasures to the falling birth rate	Measures for elderly	Social-infrastructure improvement
Japan			●	●●	
America	●			●●	
China	● ● ●	●		●	●
India					
Korea					
Philippines					

4) Cause-effect digraph

The objectives and outline of this method	This is the effective method for clarifying issues and analyzing causes using a flow chart representation of consequences when a conduct will be done (was done, occurred). Comprehending and representing the expansion of matters through causality (cause and effect) makes it possible to consider future perspectives of what results our conducts or phenomena incurred. The KJ method is also a way to examine and analyze causality.
The number of students	No limit (Both individuals and groups are possible.)
Location	Indoors
Material requirement	Paper, marker pens
Procedures	(1) Write down a theme of conduct or phenomenon (cause) in the center or in the middle left edge of the paper. (2) Write down what happens next as a consequence (result) or why it occurred (cause); write down the result and use lines or arrows to indicate items. (write matters in the point or base of arrows) (3) Consider next possible conduct/phenomena regarding each written conduct/phenomenon; connect using lines. A possible conduct/phenomenon from one conduct/phenomenon is not necessarily limited to be only one. Consider next possible conduct/phenomenon for each written items. It is effective to discuss approximately 3 stages regarding the cause of one conduct/phenomenon. (4) When the figures are completed, discuss how to address issues and solutions etc.
Points to remember	In focusing on analysis of cause and result, this method is different from association figure.

■ Examples of utilization

Theme: "What are environmental problems?"

Objectives: Analyze causes and effects of environmental problems and comprehend the structures of the earth's environmental problems through representing a kind of flow chart regarding how "population growth" and "expansion of economic activity" influence the earth's environment.

Time: 30 minutes

Requirements: Paper and marker pens

Concrete procedures:

(1) Write down "population growth" and "expansion of economic activities" in the middle left edge of the paper. (The estimated work time is approximately 2 minutes.)

(2) Write down what comes next (result) following "population growth" and "economic development (pursuit of affluence)."

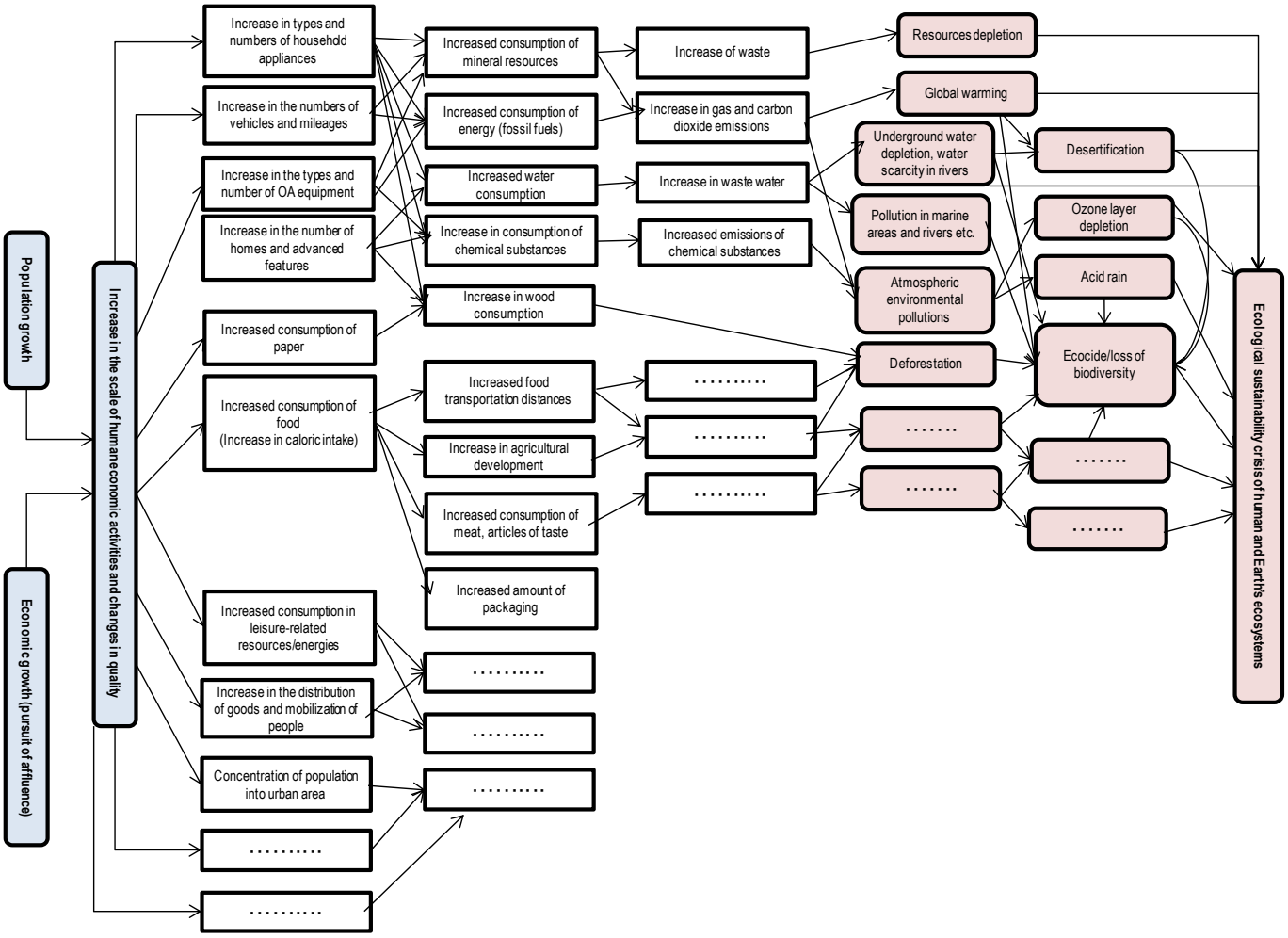
(3) Also, when the written results are interrelated, connect with further arrows.

(4) Consider possible next conduct/phenomenon regarding each written conduct/phenomenon. (The estimated work time for (2)-(4) is approximately 15 minutes.)
(5) Discuss direct/indirect confluent relation regarding “population growth,” “economic development (pursuit of affluence),” and “environmental problems.” (The estimated discussion time is approximately 10 minutes.)
(6) Share opinions by group with the whole class.

Points to remember:

- Inform students of the fact that the results which emerged are related to those of others, and add more arrows.
- Understand that the things emerging as final results are related to the crisis of human survival (disruption of the ecosystem, health damage, etc.).

【Reference】



Theme: “Human activities and disruption of ecosystems”

Objectives: Consider how human activities, specifically our daily behaviors, are related to disruption of the ecosystem and examine what kind of daily activities are required for us to conduct hereafter.

Time: 30 minutes

Requirements: Paper, marker pens

Concrete procedures:

(1) Write down “disruption of ecosystems” in the center of the paper.

(2) In the base of arrows, write down what kind of causes there are.

(3) Analyze each cause to explore further reasons.

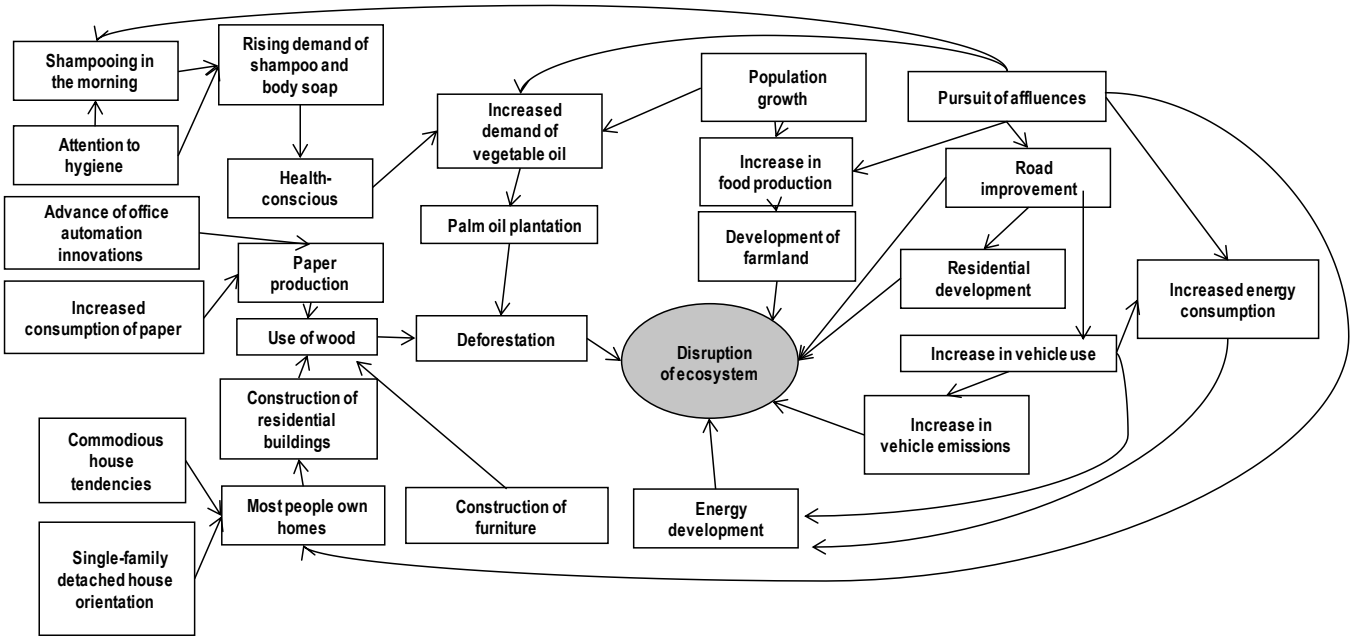
(4) Encourage students to write down as many causes as possible from the point of view that our familiar conduct causes disruption of ecosystems. (The estimated work time for (1)-(4) is approximately 15 minutes.)

(5) When the figure is completed, comprehend that most of the results are caused by human activities, and discuss what should be done on both a personal and social scale toward actions for “ecosystem conservation.” (The estimated discussion time is approximately 10 minutes.)

(6) Share opinions by group in the whole class.

Points to remember: Through exploring causes from results, as well as recognizing influences of human activity, inform students of the fact that the matters emerged as results are related to those of others, and add more arrows.

【Reference】



5) Ranking

The objectives and outline of this method	This is a method to consider priorities using cards with diverse sentences and elements. There are several types of methods such as “diamond ranking” or “pyramid shaped ranking.” When it is used by multiple students, it is effective as a method to realize that each student has a different sense of values or ideas, and learn to discuss as a group appreciating each other’s values, and agree.
The number of students	No limit (Both individual and in groups are possible)
Location	Indoors
Requirements	Cards (The number of students minutes)
Procedures	(1) Brainstorm regarding themes to consider, and write down many factors on cards. (2) Rank the written cards based on “what is considered to be important/significant.” The standards of ranking may be varied according to the themes to be considered. (When it is conducted as a group, first, rank individually and then share the results. Then, rank in the way groups can “agree” with.) (3) Consider why the rank was decided (discuss).
Points to remember	The applications are possible such as “Top 3 (set the number freely) things considered to be XX.” etc., and they can be selected from multiple choices.

■ **Diamond ranking**

Focus idea or points of discussion on “what is considered most significant” or “what is considered least important.” Write down factors on 9 cards following “themes” and rank as seen in the figures. Discuss what came to be first or the last, whether selections of each group were matched with those of other groups or not, what were difficult points, etc.

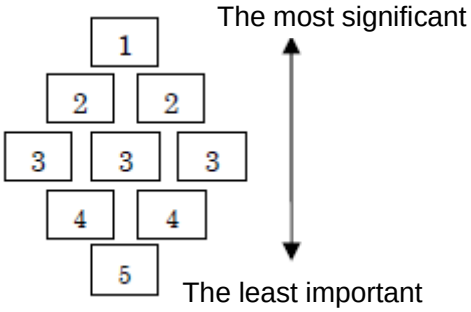


Figure: Diamond ranking

■ **Pyramid shaped ranking**

Pile up the things considered to be the most significant/important “from the bottom.” Cards are easy to handle with 10 or 15 copies. Discuss the reasons why they are ranked as such.

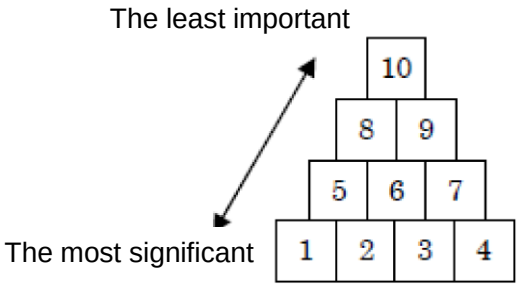


Figure: Pyramid shaped ranking

■ **Examples of utilization**

Theme: “Daily life and water”

Objectives: Consider water usages hereafter and learn the familiar amount of water usage after understanding the importance of water.

Time: 30 minutes

Requirements: Paper, marker pens, cards

Concrete procedures:
(1) Distribute cards with familiar usage of water written on them such as “bathroom,” “lavatory,” “cookery,” and “laundry” etc. and water needed for food production (virtual water) etc.
(2) Estimate the rank of the larger amount of water usage and arrange cards. (The estimated work time is approximately 5 minutes.)
(3) Present the correct answers.
(4) Discuss what were recognized or noticed.

Points to remember: Realize the large amount of water required for food production although the meanings of virtual water including natural water and simple use of water are different, while informing students of household water use to be 245L/day per capita. (Reference: Tokyo Metropolitan Government Bureau of Waterworks)

【Reference】

The use of shower for 5 minutes	60L
Pour water in a general bath tub (Family of 4)	200L
The amount of water used for feces for lavatory	12L
Washing machine (tank type) (Family of 4: 8kg)	122L

Doing the dishes by hand (37 items)	110L
Running the dish washer (37 items)	14L
Production of rice (100g) (virtual water)	370L
Production of beef (100g) (virtual water)	2060L
Production of pork (100g) (virtual water)	590L
Production of chicken (100g) (virtual water)	450L

Reference: Tokyo Metropolitan Government Bureau of Waterworks
(http://www.waterworks.metro.tokyo.jp/customer/life/g_jouzu.html)
MOEJ
(http://www.env.go.jp/water/virtual_water/vw_itiran.pdf)

Theme: “Toward environmental solutions”

Objectives: Consider what kind of action or mental reform is required and examine the significance of them.

Time: 30 minutes

Requirements: Paper, marker pens, cards

Concrete procedures:
(1) Write down approximately 10 items individually on cards regarding what kind of conduct or mental reform are required to reach environmental solutions.
(2) Line up the written cards in a diamond ranking method.
(3) Share the contents on cards written individually and the rankings, and summarize them through discussion to make one ranking. (The number of cards may be more than 10 cards.)
(4) Share the results by group and with the whole class.

Points to remember: It is important to consider policies promoting environmental solutions from a big-picture perspective.

【Reference】 (Entry examples of cards)

It is necessary to change the values to pursue material and economic affluences and to consider “what is true happiness?”.	When choosing products, make it possible to get information regarding the environmental loads of the products and evaluate them.	A social system is required to benefit corporations that address environmental issues seriously.
Recognize that society will never realize its happiness until citizens give up the idea to seek only individual happiness, and begin to strive toward all citizen happiness.	Design the consistent environmental curriculum from infancy to university age and make it possible for everyone to learn it.	Give subsidies to investment as well as establishing a Feed-in Tariff system of renewable energy
We should respect nature knowing human society is comprised through symbiosis with the ecosystems.	An economic system is required to impose more taxes and burdens for those who emit a lot of carbon dioxide and dispose a large amount of garbage.	In order to stop disposing and make long-term use more beneficial, regulate easy reconstructing residential buildings.

3. Examples Regarding Activities

1) Examples at corporations

■ Examples of corporate education

Organization: Denso Co., Ltd.

Name: Training for new employees in the technical department,
"environmental technology"

Objectives: Recognize that efforts toward environmental conservation are some of the most significant tasks among corporate activities. Learn about this company's efforts to manufacture products that consider environmental issues (air/global warming/recycle/environmental load etc. as well as environmental trend).

Target: New employees in the technical department (60 people/class x 6 classes = approximately 360 people)

Time: 195 minutes

Location: Indoors (a classroom in the corporate education facility)

Requirements: In-house textbooks and this company's (actual) products

Concrete procedures:
(1) Lecture (75 minutes) *Lecture according to the text
●Structured centering on what to know as a technical expert (environmental load substances, recyclability, weight reduction, gas emission constraint, etc.).
●Introduce examples of producing environmentally-friendly products within the company.
<Contents>
・The movement of society and industry toward environmental conservation
・The relationship between this company and environmental issues
・Product development considering environment
- The policy of this company in environmentally-friendly design, basic viewpoint, specific management/technique, concrete examples etc.
・The improvement in recyclability
・Suppression of environmental load substances
・Energy-saving by design
・Emission suppression/waste reduction by design

(2) Group workshop (90 minutes)
●Consider advantages of the products and environmental impact from an "environmental viewpoint."
●Looking at the (actual) product, and considering the manufacturing method, process, and the term from its use to abandonment, find the areas to be improved. Have discussions and share ideas.

(3) Conclusion (30 minutes)
●Practical ability to actually "take action" and "assess/improve" are necessary, not to mention "acquisition of technology and skills" to practice manufacturing environmentally-friendly products.
●Ensure the required ideas toward the practice of manufacturing environmentally-friendly products and motivate toward execution.

Points to remember:
●The instructor is an in-house instructor.
●As mere lectures cannot be lead to arouse “awareness” or “interest” of workers, design the lessons intentionally to set chances for experience such as practicing the experience with the product.

Other teaching materials and methods considered to be effective for the improvement of skills and change in attitude:
●Tour or practical exercises of successful examples at this or other corporations. For instance, what kind of shape the product of one’s own design will be when it is disposed, how it is classified. Provide an opportunity to actually see and touch them.

In the case study:
Learning through experience, not mere classroom lecture style training, is thought to be effective when studying concrete ideal efforts regarding products with a consideration of lifecycles based on the company’s products and summarizing their results and share ideas. It is likewise effective in terms of the fact that one can grasp points which s/he could not notice from multiple perspectives through other groups’ presentations, and that leads targeted fresh recruits to consider relationships between corporate activities and environmental issues at the start of their work at the company.
It is also effective to get feedback on what recruits summarized with the whole company, to compare the results each year, and to provide training opportunities for other levels and compare those results.

■ **The examples of environmental education by corporative organizations**

Organization: Japan Civil Engineering Contractors Association, Inc. <JCE>

Name: Site tour for one million citizen

Objectives: Through visiting the construction site, which is not usually open to the public, comprehend the construction industry’s role in founding a nation, and share opinions as well as learn what social capital is, the reason why the facility is necessary, and construction technology, etc.

Target: Citizens including university, high school, and junior high school students

Time: Approximately a half day (The time required depends on the location. About half day in civil areas.)

Location: Construction site (nationwide)

Requirements: Brief outline of the laboratory and description video or PowerPoint (PPT) according to workshops

Concrete procedures:
*Examples for when the target is university students
(1) At the laboratory or university classroom, explain the outline of the project, execution, and overview of the current site.
(2) Tour the inside of the site.
(3) Return to the office in the site and present questions and answers.

Points to remember:
●To answer diverse questions, it is significant to have correspondence with not only the construction company but also with both the applicant for a contract and the sponsor.

Other teaching materials and methods considered to be effective for the improvement of skills and change in attitude:

●In the case of technical college or university students, conduct this procedure as part of a school excursion or extracurricular lesson. Further, the time for a documentary movie, such as those about civil engineers who accomplish founding a business, will deepen students' understanding. ("Civil engineers who lived for people" etc.)

Reference materials etc.: http://www.dokokyo.or.jp/genba/index.htmlUH (HP)

In the case study:
This is a collaborative effort that strives to let more citizens or students know types of businesses in the civil construction industry and the roles of social capital such as the use of "tunnels" and "bridges". This could be regarded as a means of communication between corporations and society in a broad sense. It is a valued opportunity to learn through experience regarding environmental solutions by civil engineering construction companies. In addition, it is appreciated in terms of direct experience with extremely large-scale civil structures, social capital, and an opportunity to hear the voices at the site regarding ingenuity and hardships in the field. This is an example of utilization for experiential learning for students.

2) Examples at universities

■ Examples of fieldwork

Organization: Department of Environmental Science, The University of Shiga Prefecture

Name: Environmental field work I

Instructors in charge: Professors in the department
*Chairperson of the Environmental Field Work Committee: Prof. Yoshimasa Kurashige (faculty member in Environmental Ecology, Department of Environmental Science, The University of Shiga Prefecture)

Objectives: Acquire a viewpoint to identify problems in the environment. Cultivate basic skills regarding presentation or writing a report.

Target: All of the freshman students in the Department of Environmental Science, The University of Shiga Prefecture (quota: 180 people)

Time: 3 periods/time x 15 times/half a year = 45 periods

Location: The lecture room at the University of Shiga Prefecture (classroom learning), mountain village area, community, mountains and forests, rivers in the prefecture

Requirements: Separate rain coat, field book and pencils, snow suits, high boots, (items which are available or will make it possible to do fieldwork even if it rains, etc.) Teaching materials are distributed according to each program component as reference materials (maps, etc.).

Concrete procedures:
The target is all freshmen students in the Department of Environmental Science at the University of Shiga Prefecture. The program, combining lecture, fieldwork, and presentation, will be held during the 3rd period of every Tuesday in the first semester of the lecture schedule. Total: 15 times. (Corresponding to three units.)

【Themes】
For the fieldwork, the following 4 local themes are set, and activities will be conducted by group.
(1) Water systems and living spaces
(2) Natural and social environments regarding farmland around the Aichi River
(3) Waste and recycling

(4) The structure and functions of the drainage basin environment

【Group activity】
Divide the class into 4 groups according to the abovementioned 4 themes, and each group will experience all of the 4 activity areas as a set, a total of 3 times.
*1st week: Information organization through lecture, 2nd week: Field survey, 3rd week: Group discussion and presentation

【Schedule】
The first session: The whole lecture
2nd - 13th sessions: Group activity (3 times x 4 local themes)
14th session: Preparation for the presentation to the whole class
15th session: The presentation to the whole class

Points to remember:
●Appoint 3-4 faculty members in varying fields.

Other teaching materials and methods considered to be effective for improvement of skills and change in attitude:
●Through directly listening to accounts from competent mountain and forest managers, village elders, fishermen, local citizen volunteer guides, etc, learn the etiquette of listening to receive direct and strong messages from local leaders.

Reference materials etc.:
“The Recommendations of Environmental Fieldwork from Biwa-ko (Lake Biwa)” (Showa-do: 2007)

In the case study:
This is a valued experiential learning tool achieved through widely utilizing the natural areas at the university location, human lifestyles, history, industry, and social systems (waste treatment/recycle system); a study to nurture skills to not only experience but also summarize the experience or results; moreover, it is valued as a learning example providing multiple effects to develop an ability to identify problems based on this experience or examination, and consider the cause and relevance to one’s own lifestyle.
Also, it is appreciated as an example of a whole school effort with faculty members of diverse expertise collaborating in cooperation with each other. This is valuable as a cross-faculty and community-based effort.

■ Examples of workshop style lessons (brainstorming)

Organization: Graduate School of Intercultural Communication, Rikkyo University

Lecture title: Environmental communication theory

Instructor in charge: Prof. Tadashi Kawashima (specially appointed professor at Rikkyo University Graduate School of Intercultural Communication by 2010)

Target: University students, approximately 15 people (elective)

Objectives: Through experiencing a communication method, “brainstorming,” (a meeting to exchange many ideas), aim at making utilization possible in diverse scenarios as well as learning the method.

Time: 1 lesson (90 minutes)

Location: Indoors (preferably a room with movable desks and chairs)

Requirements: Dozens of A4 sized copier paper (backing paper), writing materials

Concrete procedures (example):
(1) Form 3 teams of 5 people (in the case of 15 people: 4-5 people are an appropriate size for 1 team.)
(2) 【Brainstorming rehearsal】
(When the communication among students is not yet sufficient, the following practice is recommended. When the relationships are already formed, the activity in (2) may be skipped, and the ones after (3) can be practiced.)
Select a familiar theme, easy for students to consider (anything is possible)
Theme example: “I wish there were this type of mobile phone,” “What is a good cafeteria?” etc.
(3) Ensure the rules when practicing brainstorming
【Four rules for brainstorming】
・Record all of the remarks.
・Do not deny others’ opinions.
・Do not be responsible for one’s own comments.
・Focus on quantity over quality, and share as many opinions as possible
(4) 【Brainstorming practice】
(If time allows, brainstorm topics.)
・Theme example: “Our possible environmental solutions (through our own devises and efforts) at graduate students’ rooms or lounge”
・Have a presentation of opinions by each team representative as a result of group brainstorming sessions.
(The presentation method: Posting all the opinions (or sharing all the ideas orally), presentation of 3-5 chosen “favorites,” etc. Consider according to the situation as necessary.
・Individually summarize the thoughts on this practice, and share with the group regarding brainstorming. (The use of directions regarding what to write down, “review form,” may be possible.)
・Last, present an instructor lecture regarding the meaning, essential points, and future action, etc.

Points to remember:
●Select appropriate brainstorming themes according to students’ expertise, age, etc.
●Conduct time management appropriately. (Indicate a clear work time for each.)
●During the last part of this lesson, focus on “what was gained through this practice.” (By means of the practice state, what is to be learned may vary each time.)
In the case study:
The structures of causes regarding environmental issues are related to diverse matters such as socio-economic systems, lifestyle, history, etc. and are complicated as well. In a developing environmental ability, “ability to understand the relevance of our conduct to environmental issues,” “communication ability,” and “facilitation ability” should be emphasized. The effects of brainstorming are to put hazy ideas together by representing them as keywords, recognize the similarities and differences of others’ opinions and ideas, and summarize opinions through a whole discussion considering others’ opinions and other criteria, etc. This is considered to be effective as an educational method to develop environmental ability.

■ Examples of a workshop style lesson (KJ method)

Organization: Graduate: The Department of Economics/Graduate School of Global Environment Studies, Sophia University

Lecture title: Population in the Modern World

Instructor in charge: Prof. Hiroshi Kito (The Department of Economics/Graduate School of Global Environmental Studies, Sophia University)

Target: All students enrolled at Sophia University (all grades) approximately 300 students (elective course)

Objectives: In order to understand the essence of population issues, strive to comprehend population from a broad perspective. Further, through students' participation, raise their awareness of the issues, and provide the opportunity to consider population and low fertility, refugees and international conflict, the relation to environmental issues, and connections to oneself.

Time: 1 lesson (90 minutes)

Location: Indoors

Requirements: Memo paper, adhesive notes, paper to submit (A4)

Concrete procedures (example):
In the introduction lesson (first lesson), "Population in the Modern World," which is comprised of 15 lessons (including examinations), draw out students' diverse ideas regarding the relations between environmental issues and population so that they can understand broader perspectives.
(1) Form groups or 5-6 students seated close to each other.
(2) Name the groups. Also, determine role sharing in the group (leader, secretary, etc.).
(3) Conduct a student brainstorming session to discuss "keywords associated with the word "population." Write down keywords on the sheet individually.
(4) Discuss regarding all opinions exchanged through the brainstorming by group, and summarize the top 5 opinions on the submission paper as the opinions of the group.
(5) The teacher will summarize using the "KJ method" and share during the next lesson. Understand how one's opinion ranks on the whole, or how one's opinions are related to those of others, etc.

Points to remember: In sharing opinions through brainstorming, write down only keywords. Also, when submitting the summarized opinions, enter only keywords.

In the case study:
The KJ method is the approach Jiro Kawakita (professor emeritus at Tokyo Institute of Technology) designed to summarize data using a process to describe the data on cards, put the cards together by group, illustrate with diagrams, and summarize into a report. (KJ - the initials of the originator.) This method makes it possible to integrate fragmented data, generate creative ideas, explore problem-solving ideas, clarify the relevance between each data, and forge a convergence of many opinions. While the viewpoints of the causes of environmental issues and solutions are quite diverse, these varied causes or solutions are interrelated. Concerning these points, the KJ method is considered to be effective as an approach to lessons regarding environmental issues.
Further, although summarizing students' opinions by themselves is also effective, it should be noted that the appropriate recapitulation of opinions through the KJ method requires certain training.

■ **Examples of lessons using question and answer style instruction and dialogue with teachers**

Organization: The Department of Urban Engineering, The University of Tokyo

Lecture title: Introduction to Urban Environment

Instructor in charge: Takashi Mino (Graduate School of Frontier Science, The University of Tokyo, Chief in the Division of Environmental Research, Professor in Department of Social and Cultural Environment, holds the concurrent position at School of Engineering, the University of Tokyo, in charge of authoring the sustainability education guideline draft, holds the concurrent position at Integrated Research System for Sustainability Science (IR3S), The University of Tokyo.)

Target: Sophomore students at The Department of Urban Engineering, The University of Tokyo (basic program in area of expertise); number of students is approximately 60.

Objectives: In many cases, environmental problems are generated as a result of complicated elements. The goal of this lesson is to comprehend the types of viewpoints to understand “environment” or “environmental problems.” First, ask students, “What is environment?” and after ensuring their subconscious images of environment, learn the diverse viewpoints of environment and the necessity of a bird's eye viewpoint for the consideration and solution of environmental problems through exchanging opinions and reviewing with the whole class.

Time: 1 lesson (90 minutes)

Location: Indoors

Requirements: Teaching material slides (PowerPoint: PPT)

Concrete procedures (example):
In the introduction (1st) lesson, “Introduction to Urban Environment,” which is composed of 15 lessons, deal with environment broadly, and ask questions regarding “what environment is” divided into three stages.
(1) Introduce the definition of environment in the Daijirin Japanese Dictionary.
(2) As question 1, encourage students to express what “environmental problem” is with their own words.
(3) In question 2, though environment is defined in a dictionary as “the world surrounding us,” ask students what kind of environment they are conscious of, for example, when they suggest definitions for “environment problem,” ask them to consider who (or what) the environment is for, or whom (what) the environment is surrounding.
(4) In question 3, when students tried to define “environmental problem,” ask them questions regarding the target each of them thought of unconsciously, such as the physical scale, spatial extent, or a boundary.
(5) Encourage students to illustrate concrete examples of what they consider to be “environment problem.”
(6) Through the abovementioned questions, make students aware that the viewpoints of problems expressed verbally as “environmental problem,” that they unconsciously used thus far, are differentiated from each other and are vague in meaning.
(7) Next, show several slides titled “What are environmental problems, once again?” and present specific examples to help students understand the viewpoint of environmental issues. To begin with, present examples to consider “the relationship between human and nature.”
(8) Then introduce “the change of environmental problems over time,” “environmental problems span over space,” and “the diversity of environmental problems.” When introducing the examples mentioned above, after teacher’s introduction of the examples, lead the lesson encouraging students to consider regarding the meaning of the examples

and characteristics.
(9) Summarize the arguing points of environmental problems as the recapitulation of the matters above, as follows:
●The relationship between human and nature ⇒ The meaning of human-centered thinking and considerations for the ecosystem
●How to understand tract ⇒ The change of environmental problems due to intergenerational ethics and the course of time
●How to comprehend the spatial expanse ⇒ environmental problems beyond the boundaries
●Positive and negative trade-offs ⇒ Comprehension of complex system structure
(10) Last, as an example to understand environmental problems in which diverse elements are complicatedly related to each other from a bird's eye viewpoint, show the conceptual diagram of sustainability illustrating the interrelations between the following three systems - “global system,” “social system,” and “human system” - and the directions of solution proposed by IR3S (Integrated Research System for Sustainability Science) and conclude the lesson.
Points to remember:
Teaching materials Power Point (PPT) on which the questions are described will not be distributed as handouts in advance; consider what students think on their own during class, encouraging them to share opinions.

Supplement: This lesson is introduced as a lesson plan in the introduction part in “Introduction to Urban Environment” for School of Engineering, The Department of Urban Engineering, The University of Tokyo. In this program, which is composed of 14 lessons, Prof. Mino will continuously lead an historical overview of environment problems (thus far 4 lessons), and then 7 lessons featuring lectures on itemized discussions will be held by another teacher. Further, for 3 lessons, Prof. Mino will hold lectures about what sustainability is (seminar style), and what sustainability indicator groups are, etc.

In the case study:
When teaching environmental problems, recognizing the complexity of environmental problems and their relevance to diverse elements is significant. In this example, it is considered to be particularly effective to help students to think on their own through dialogue between teachers and students and recognize their deepening or changing thoughts.

List of References and Video Materials for Further Understanding of the Guideline

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2. Video Materials

- NHK Eco Channel <http://www.nhk.or.jp/eco-channel/>
  “NHK Eco Channel” is NHK’s video site specialized for environmental information. It provides videos on environmental problems including global warming, climate change and waste problems, and also on various themes such as nature and eco-life, CSR, and environmental education. Many of those videos are around 2 to 10 minutes, which may be used partially in class (by playing on the website).

- Green TV JAPAN <http://www.japangreen.tv/>
  “Green TV JAPAN” is an environmental video medium which transmits contents on its website, as well as providing environmental video contents to various media and channels to actively promote popularization and edification for improvement of environmental awareness. Its website provides videos on themes of global warming, natural environment and biodiversity, etc. Most of those videos are within 10 minutes.
  They also support environmental education classes using Green TV in order to promote environmental education. Environmental education classes are provided by them using video programs transmitted on Green TV. They also dispatch instructors.

- Earth Vision Tokyo Global Environmental Film Festival <http://www.earth-vision.jp>
  “Earth Vision Tokyo Global Environmental Film Festival” started as the first global environmental film festival in Asia in 1992, when Earth Summit took place, and it aims to create a place to evoke motivation to think about global environmental through films. The films are not provided on the website, but can be rented with charge and purchased. Many of them are around 30 to 110 minutes, but there are some videos of 1 to 5 minutes.

- TVE Japan
  “TVE Japan” is a non-profit organization and an environmental NGO which produces and distributes environmental films. They do not provide their films on the website, but sell them. Many of them are comparably long, around 25 to 100 minutes.

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